# FINAL

# Revised $PM_{10}$ State Implementation Plan for the Salt River Area


**AIR QUALITY DIVISION**

**ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY**

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# Chapter 1: INTRODUCTION

## 1.1 OVERVIEW

In a ruling published July 2, 2002, EPA found the Arizona Department of Environmental Quality's (ADEQ's) *Plan for Attainment of the 24-Hour $PM_{10}$ Standard – Maricopa County $PM_{10}$ Nonattainment Area* (May 1997), inadequate to achieve attainment of the 24-hour National Ambient Air Quality Standards (NAAQS) for particulate matter 10 microns or fewer in diameter ($PM_{10}$) at the Salt River monitoring site. The 1997 ADEQ SIP revision included attainment and Reasonable Further Progress (RFP) demonstrations for the 24-hour NAAQS at the Salt River air quality monitoring site of the Maricopa County $PM_{10}$ Serious Nonattainment Area, as well as in three other monitoring sites in the Phoenix area, - the Maryvale, Gilbert, and West Chandler sites. On August 4, 1997, EPA approved ADEQ's attainment and RFP demonstrations for the Salt River monitoring area, which showed that the 24-hour $PM_{10}$ NAAQS would reach attainment in the area by May 1998 (62 FR 41856, August 4, 1997). Due to continuing violations of the 24-hour $PM_{10}$ NAAQS at the Salt River air quality monitoring site since May 1998, however, EPA subsequently required Arizona to submit a revision to correct SIP inadequacies (67 FR 44369, July 2, 2002).

This document consists of Arizona's revisions to the state implementation plan for the Maricopa County $PM_{10}$ Serious Nonattainment Area and includes the following SIP requirements, as described by EPA in its Federal Register notice of disapproval (67 FR 44369, July 2, 2002):

- A modeling demonstration showing that the level of emissions reductions from application of Best Available Control Measures (BACM) / Most Stringent Measures (MSM) for all significant sources of $PM_{10}$, will result in attainment of the 24-hour National Ambient Air Quality Standards (NAAQS) by December 31, 2006, at the Salt River $PM_{10}$ monitoring site (in accordance with CAA §§ 189(b)(1)(A) and 188(e));

- Commitments to implement BACM / MSM for sources significantly contributing to exceedances of the 24-hour $PM_{10}$ standard in the Salt River area as expeditiously as possible (CAA § 189(b)(1)(B)), and a commitment that all BACM and MSM control measures adopted and applied to sources in the Salt River Study Area will be applied to all similar sources throughout the Maricopa County $PM_{10}$ Serious Nonattainment Area;

- A demonstration that the plan constitutes Reasonable Further Progress (RFP) up to the attainment deadline, December 31, 2006; and

- A demonstration that all the requirements of the federal Clean Air Act Amendments (CAA) that pertain to serious $PM_{10}$ nonattainment areas are met (including CAA §§ 110(l), 110(a)(2)(E)(i), 40 CFR §§ 51.280, and 51.111).

## 1.2 BACKGROUND

### 1.2.1 Regulatory History of the Maricopa County $PM_{10}$ Nonattainment Area

On November 15, 1990, Congress enacted the 1990 Clean Air Act Amendments, in accordance with the provisions of which, EPA classified U.S. $PM_{10}$ nonattainment areas meeting the qualifications of CAA § 107(d)(4)(B), including the Maricopa County $PM_{10}$ Nonattainment Area, as moderate $PM_{10}$ nonattainment areas, by operation of law. Pursuant to the provisions of the 1990

CAA § 188(a), EPA required that Arizona, and other U.S. moderate $PM_{10}$ nonattainment areas, demonstrate attainment of the $PM_{10}$ NAAQS by December 31, 1994. On November 15, 1991, Arizona submitted its moderate area $PM_{10}$ plan to EPA.

In 1995, EPA issued final approval to Arizona's moderate area $PM_{10}$ state implementation plan, (60 FR 18010, April 10, 1995). The revised SIP provided $PM_{10}$ control measures applicable to sources including paved roads, construction and demolition activities, unpaved parking areas and roads, nonmetallic mineral mining and processing facilities, open burning activities, uncovered haul trucks and farming operations. On April 27, 1995, Arizona Center for Law in the Public Interest (ACLPI) filed suit (Ober v. EPA) challenging EPA's approval of Arizona's 1991 particulate plan, due to the plan's failure to address the 24-hour $PM_{10}$ NAAQS standard. The suit, filed in Tucson Federal District Court, requested that the Court order EPA to produce a Federal Implementation Plan (FIP).

Due to continued exceedances of both the annual and 24-hour $PM_{10}$ NAAQS, and failure of the area to attain the $PM_{10}$ NAAQS by the December 31, 1994, deadline for moderate nonattainment areas, EPA reclassified the Phoenix Planning Area as a "serious" nonattainment area for $PM_{10}$, by operation of law, on May 10, 1996 (61 FR 21372, May 10, 1996). The action allowed Arizona 18 months to develop a new state implementation plan that would provide for attainment of the $PM_{10}$ NAAQS by December 31, 2001, the CAA attainment date for serious nonattainment areas.

On May 14, 1996, the U.S. Ninth Circuit Court of Appeals vacated EPA's 1995 approval of Arizona's moderate $PM_{10}$ plan, and on March 25, 1997, the U.S. District Court approved a consent decree that required EPA to propose a Moderate Area Federal Implementation Plan (FIP), if EPA disapproved all or part of ADEQ's 24-hour $PM_{10}$ plan. On August 4, 1997, EPA partially approved and partially disapproved ADEQ's microscale plan, the *Plan for Attainment of the 24-Hour $PM_{10}$ Standard – Maricopa County $PM_{10}$ Nonattainment Area*, submitted May 9, 1997 (62 FR 41856, August 4, 1997).

On December 10, 1997, Arizona submitted the Maricopa Association of Government's (MAG's) *Serious Area Committed Particulate Control Measures for $PM_{10}$ and Support Technical Analysis*. On February 25, 1998, EPA found that Arizona had failed to submit: the regional moderate $PM_{10}$ area requirements for the 24-hour $PM_{10}$ standard; the serious area plan requirements for the annual $PM_{10}$ standard; and the regional serious area requirements for the 24-hour standard, the deadline for each of which was December 10, 1997. EPA's action triggered the 18-month time clock for mandatory application of sanctions, and a two-year FIP clock (63 FR 9423, February 25, 1998).

On August 3, 1998, in accordance with the requirements of Ober v. EPA consent decree, EPA published a FIP to address moderate area $PM_{10}$ requirements in the Maricopa County $PM_{10}$ Nonattainment Area, under the authority of CAA § 110(c)(1). By this action, EPA finalized disapproval of Arizona's moderate area plan RACM, RFP, and impracticability demonstrations; and required that Arizona demonstrate that: it could not meet $PM_{10}$ standards by the statutory deadline; that RACT would be implemented expeditiously and that RFP standards were being met. In addition, EPA set forth a fugitive dust rule to control $PM_{10}$ emissions from vacant lots, unpaved parking lots, and unpaved roads, as well as an enforceable commitment to ensure the application of RACM to agricultural sources in the Phoenix area (63 FR 41326, August 3, 1998).

MAG's Regional Council adopted the MAG 1999 *Serious Area Particulate Plan for $PM_{10}$*, June 23, 1999. The Plan contained approximately 77 state and local government control measure commitments.

On June 29, 1999, EPA withdrew its August 1998 FIP requirement that Arizona adopt and

implement RACM for agricultural fields and aprons in the Maricopa County $PM_{10}$ nonattainment area, due to Arizona's adoption of legislation requiring that agricultural sources implement best management practices (BMP), which EPA determined were compliant with CAA RACM requirements, to control fugitive dust in the area (64 FR 34726, June 29, 1999). On July 9, 1999, ADEQ submitted MAG's plan to EPA.

In November 1999, EPA notified MAG of deficiencies in its *Serious Area Particulate Plan for $PM_{10}$*, submitted in June 1999, sufficient to cause EPA disapproval of the proposed SIP revision. EPA indicated that the SIP inadequacies related to the level of source compliance that the SIP assumed with respect to Maricopa County's two fugitive dust rules, and the absence, or insufficiency, of controls the SIP provided to address fugitive dust from public and private unpaved roads.

In its February 16, 2000 *Revised MAG 1999 Serious Area Particulate Plan for $PM_{10}$ for the Maricopa County Nonattainment Area*, MAG demonstrated attainment of both the annual and 24-hour $PM_{10}$ standards. In response to the deficiencies noted by EPA, and to address the SIP approvability problem, MAG amended its Transportation Improvement Program for fiscal year 2000-2004, including a program to pave Maricopa County public, and publicly-maintained, dirt roads and allocated funding for, and committed to, the purchase of $PM_{10}$-efficient street sweepers. In addition, Maricopa County committed to strengthening enforcement of its fugitive dust rules.

In recent, additional actions, EPA approved or proposed approval of the following control measures for the Maricopa County $PM_{10}$ Nonattainment Area:

- In response to the requirements of CAA § 110(a) and Part D, Arizona rules (Maricopa County Rule 318, "Approval of Residential Woodburning Devices," and the Maricopa Residential Woodburning Restriction Ordinance, adopted April 21, 1999) controlling particulate matter emissions from residential wood combustion in the Maricopa County $PM_{10}$ Nonattainment Area. EPA's ruling incorporated the rules into the federally-approved Arizona State Implementation Plan (approval, 64 FR 60678, November 8, 1999);

- In response to the requirements of CAA § 189(a)(1)(C), a general permit rule (A.R.S. 49-457, approved as RACM) providing for the implementation of Best Management Practices (BMPs) to reduce $PM_{10}$ from agricultural sources in the Maricopa County $PM_{10}$ Nonattainment Area, in a revision to the Arizona State Implementation Plan (approval, 66 FR 51869, October 11, 2001); and

- Revisions to the Arizona Cleaner Burning Gasoline (CBG) program currently approved in the Arizona State Implementation Plan, which will replace Arizona's interim CBG program with a permanent program, amend the wintertime CBG program to limit the types of gasoline that may be supplied, and remove the minimum oxygen content requirement for summertime gasoline (proposed approval, 68 FR 55920, September 29, 2003).

On July 2, 2002, EPA found the controls proposed in ADEQ's May 1997 *Plan for Attainment of the 24-Hour $PM_{10}$ Standard – Maricopa County $PM_{10}$ Nonattainment Area*, inadequate to ensure the attainment of the $PM_{10}$ NAAQS at the Salt River air quality monitoring sites. The finding of inadequacy included the SIP's attainment and RFP demonstrations for the 24-hour $PM_{10}$ standard at the Salt River monitoring sites, as well as for three other microscale sites in the Maricopa County $PM_{10}$ Nonattainment Area (Maryvale, Gilbert, and West Chandler).

Although EPA approved Arizona's 1997 SIP revision, and additional required controls proposed by MCESD on August 4, 1997 (62 FR 41856), EPA's Aerometric Information Retrieval System (AIRS)

continued to show exceedances at the Maricopa County $PM_{10}$ Nonattainment Area Salt River site, recording expected exceedances in 1999, 2000, and through three quarters of 2001. EPA required Arizona to submit a SIP revision to identify and implement corrective $PM_{10}$ control provisions in the Salt River Study Area, and for similar, significant sources in the Maricopa County $PM_{10}$ Nonattainment Area (67 FR 44369, July 2, 2002). Arizona's SIP revision was due to EPA 18 months following the effective date of its action, or by February 2, 2004, to provide for attainment in the Salt River site, no later than December 31, 2006, in accordance with CAA §§ 189(b)(1)(A), and 188 (e).

Also in July 2002, EPA approved Arizona's serious area $PM_{10}$ plan for the Maricopa County part of the Maricopa County $PM_{10}$ Nonattainment Area; granted Arizona's request to extend the CAA deadline for attainment of the annual and 24-hour $PM_{10}$ standards from 2001 to 2006; and approved the Maricopa County Environmental Services Department's (MCESD's) fugitive dust rules, Residential Woodburning Restrictions Ordinance, and commitments by Maricopa County jurisdictions to implement $PM_{10}$ controls (67 FR 48718, July 25, 2002).

### 1.2.2 $PM_{10}$ National Ambient Air Quality Standards (NAAQS)

In promulgating its initial particulate matter standards in 1971, EPA published primary and secondary particulate standards applicable to, "total suspended particulate matter" ("TSP") which applied to airborne suspended particulate matter, without reference to particle size. The primary, or "health-based," standards established 260 micrograms per cubic meter ($\mu/m^3$), as the 24-hour average standard, not to be exceeded more than once annually. EPA established a separate primary annual TSP standard, 75 $\mu/m^3$, determined by calculation of annual geometric mean measurements. The secondary standard, designed to protect public welfare, was established at 150 $\mu/m^3$, calculated as a 24-hour average, and not to be exceeded more than once per year.

On July 1, 1987, EPA replaced the concept of TSP, focusing on particulate matter 10 microns in diameter or smaller, or $PM_{10}$, as the applicable ambient standards (at 52 FR 24634). In addition, EPA collapsed the primary and secondary standards into one set of standards to protect both public health and welfare. EPA's 1987 standard established150 $\mu/m^3$, as the new 24-hour standard, with no more than one expected exceedance annually; and 50 $\mu/m^3$, as the expected annual arithmetic mean, as the new annual standard.

July 18, 1997, EPA revised the 1987 24-hour NAAQS standards applicable to $PM_{10}$, specifying that the 24-hour $PM_{10}$ standard would be based on the $99^{th}$ percentile of 24-hour concentrations at each monitor within an area, and added separate standards applicable to particulate matter 2.5 micrometers or fewer in diameter, or $PM_{2.5}$ (62 FR 38652, July 18, 1997). The new standards were issued to provide increased protection to the public, especially children, the elderly, and other at-risk populations. On December 22, 2000, following a ruling of the U.S. Court of Appeals for the District of Columbia Circuit, EPA took final action to remove 40 CFR § 50.6(d) from federal regulations applicable to national primary and secondary ambient air quality standards for $PM_{10}$, since the Court had decided that the particulate standards, as revised in 1997, constituted double regulation of the $PM_{2.5}$ component of the $PM_{10}$ NAAQS (65 FR 80776). The $PM_{10}$ rules in 40 CFR § 50.6(a) and (b) remained in effect, however.

The current $PM_{10}$ standards are as set forth at 40 CFR § 50.6. The primary and secondary 24-hour $PM_{10}$ NAAQS standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu/m^3$, is equal to or less than one.

### 1.2.3 Location of the Maricopa County $PM_{10}$ Nonattainment and Salt River Study Areas

EPA formally designated Maricopa County as nonattainment for particulate matter in April 1974. On March 3, 1978, EPA published a list of Total Suspended Particulate (TSP) nonattainment areas, in accordance with 1977 Clean Air Act Amendment requirements (43 FR 8964). The March 1978 EPA ruling identified the area of Maricopa County as nonattainment for TSP.

EPA later replaced TSP standards with new standards that applied only to particulate matter ten microns or fewer in diameter (52 FR 24634, July 1, 1987). On August 7, 1987, EPA identified the Phoenix Planning Area as a "Group I" area, an area highly likely to violate the new NAAQS standards for $PM_{10}$ (52 FR 29383). On October 31, 1990, EPA provided technical corrections to clarify the descriptions of the $PM_{10}$ areas of concern, after collecting data on area source emissions, and ambient $PM_{10}$ concentrations; identifying control measures; and predicting future $PM_{10}$ concentrations using dispersion models (55 FR 45799, October 31, 1990).

The October 1990 technical corrections defined the boundaries of many U.S. $PM_{10}$ nonattainment areas, including the Phoenix Planning Area $PM_{10}$ Nonattainment Area. The Phoenix Planning Area boundaries exist today as EPA defined them in October 1990. For the purposes of this SIP, the Phoenix Planning Area is referred to as the Maricopa County $PM_{10}$ (Serious) Nonattainment Area (geographically defined in Table 1.2.3). Figure 1.2.3-A (page 15) depicts the geographical area encompassing the Maricopa County $PM_{10}$ Nonattainment Area.

**Table 1.2.3 Maricopa County $PM_{10}$ Nonattainment Area, Maricopa and Pinal Counties**

**Located in Maricopa and Pinal Counties, the Phoenix Planning [Maricopa County] $PM_{10}$ Nonattainment Area is defined as the rectangle determined by and including the Townships and Ranges as noted, below.**[1]

| | |
|---|---|
| T6N, R3W | The Phoenix Planning Area was designated as a moderate $PM_{10}$ nonattainment area, November 15, 1990, and as a serious $PM_{10}$ nonattainment area, June 10, 1996. |
| T6N, R7E | |
| T2S, R3W | |
| T2S, R7E | |
| T1N, R8E | |

Source: 40 CFR § 81.303, 1978, as amended at 55 FR 45799, October 31, 1990

The Salt River Study Area portion of the Maricopa County $PM_{10}$ Nonattainment Area contains approximately 32 square miles in metropolitan Phoenix, which is in the center of the Salt River Valley. The study area is bounded by 59th Avenue to the west; 10th Street, to the east; Van Buren Street to the north; and Baseline Road, to the south (see map of the Salt River Study Area, Figure 1.2.3-B, page 16).

[1] Although EPA finalized the rule that defined the current boundaries of the Phoenix Planning Area at 57 FR 56714, on November 6, 1992, ADEQ will seek a technical correction of the EPA-defined boundaries, based on a 1991 Arizona boundary submittal request.

### 1.2.4 Physical Geography, Soils, Climate, and Meteorology of Metropolitan Phoenix , and the Salt River Study Area

*Physical Geography*

The normally-dry, Salt River Channel crosses the study area at about mid-point, east to southwest. Although once a natural perennial stream with mesquites, willows, and cottonwood trees, the Salt River is now a dry river that has been altered by levee work and channelized along different parts of the river. The Salt River is classified as an ephemeral stream, since flows result from controlled water releases from dams many miles upstream, as well as rainfall and local sources discharge into the dry river channel.[2] The form of the Salt River channel is directly related to past regional flood events and human activities, such as sand and gravel mining.

From a broad geographic perspective, Phoenix is located in the Basin and Range Province, which is one of three provinces comprising the Intermontane Plateaus Major Division. The Basin and Range Province begins south of the Columbia Plateaus and comprises most of Nevada and portions of Oregon, California, Idaho, Utah, and southern Arizona. In Arizona, the Basin and Range Province, which runs in a northwest-southeast direction across the state, is divided into the Mexican Highlands section to the north and the Sonoran Desert section to the south that extends southward into Sonora, Mexico, and Baja, California. This physiographic province is characterized by several linear basins filled with debris from surrounding mountains, composed of metamorphosed sedimentary and volcanic rocks or of intrusive granitic rocks. Typically, these are fault-block mountains formed by faulting and tilting of the earth's crust.

The basins in the province are filled with thick deposits of gravel, sand, silt, clay, and other sediments as a product of continental sedimentation. The result is desert rangelands over basin floors. Several small mountain ranges with relatively small geographic coverage, rise above the desert floor with elevations ranging from approximately 2,600 to 4,500 feet above mean sea level, surrounding the metropolitan Phoenix area: the South Mountains are located six miles to the south (T1S, R3E, Section 21); 18 miles to the southwest lie the Sierra Estrella Mountains (T2S, R1E, Section 8); eight miles to the north are the Phoenix Mountains with Piestewa Peak (T2N, R3E, Section 2); and 30 miles to the west-northwest, and north-northeast, 6 miles, respectively, lie the White Tank Mountains (T3N, R3W, Section 28), and Camelback Mountain.

Although the elevation of Phoenix is approximately 1,100 feet above sea level, elevations vary from one direction to another with increasing elevations to the east. The following illustrates how elevation contours change within the study area.

*Soils*

Phoenix is located in the northern edge of the Sonoran Desert in a large alluvial basin. The region

[2] Phoenix is located in the lowlands hydrologic province. Reservoirs hold the perennial streams of the Central Highlands hydrologic province which lies north and northeast of Phoenix. The Roosevelt Dam, which was completed in 1911, was the first Reclamation Service project. It dammed off the Salt River about 60 miles to the east. Three more dams were built on the Salt River between 1923 and 1930: Mormon Flat Dam, Horse Mesa Dam, and Stewart Mountain Dam. A project that raised the elevation of Roosevelt Dam reduced peak flows and flow duration down the Salt River.

is arid, consisting of stream-carved valleys with alluvial sands, playa deposits, gravels, and sedimentary formations. The Sonoran Desert contains more species of plants and animals than any other desert in North America. The distribution of plants, which is related to the plant life in the regions south and west, is dependent on a variety of interacting environmental factors (e.g., temperature, precipitation, soil, and slope). It contains, for example, a variety of cacti (e.g., saguaro, organ pipe, cholla), wild flowers, bushes, trees, and grasses. Native vegetation includes mesquite, catclaw, creosote bush, cacti, bursage, ironwood, arrowweed, saltbush, desert thorn, annual grasses, and weeds. Plant invasion from other proximate vegetation associations have reduced the area covered by grasslands and altered other vegetation. Invasions include woody species and changes in the mix and density of nonwoody species of plants. The area also has ephemeral vegetation due to the biseasonal precipitation distribution in the Sonoran Desert.

Soil types found in Maricopa County are classified as Hyperthermic Arid, based on temperature and precipitation zones. These soils have a mean annual soil temperature of 72E F or higher and receive less than 10" of mean annual precipitation.[3] These soils are found at the lower elevations in the western and southwestern part of the state, covering about 27 percent of Arizona.

Ten subgroup associations comprise Hyperthermic Arid soils. The Torrifluvents Association is comprised of well-drained soils formed in sandy to clayey recent mixed alluvium on floodplains and adjacent lower alluvial fans, for example, of the lower Salt River. The soil classification under this association is the “Typic Torrifluvents” that can be described as stratified, coarse to finely textured on nearly level to gently sloping hills from elevations of 100 to 2,500 feet.[4]

The Salt River Study Area mainly contains soils formed from floods. The stream channels and terraces in the Salt River, for example, mainly is comprised of Carrizo-Brios soil, characterized as nearly level to gently sloping gravelly sandy loams and sandy loams. The remaining soil in the Salt River Study Area is comprised of Gilman-Estrella-Avondale soil, characterized as nearly level loams and clay loams on valley plains and low stream terraces. Only a very small area in the southern part of the study area is comprised of Laveen-Coolidge and Mohall-Laveen soils. These soils are characterized as nearly level sandy loams, loams, and clay loams on old alluvial fans and valley plains.[5] Other soil classifications comprise several other associations found in Maricopa County. These soils range from fine to coarse or gravelly textured soils on broad valley plains and shallowly dissected alluvial fans and valley slopes.

*Climate and Meteorology*

The greater Phoenix area experiences hot summers and relatively warm winters with fewer weather changes than most parts of the U.S. The average daily maximum temperature in July is 105.9° F (Fahrenheit), and the average low temperature in January is 41.2° F. The year-round average temperature is 72.6° F, with daily normal high and low temperatures of 85.9° F and 59.3° F, respectively. The Phoenix metropolitan area receives about 300 days of sunshine per year, while average annual rainfall is fewer than eight inches, with overall low humidity (see Table 1.2.4).

The climate and meteorology for the Salt River Study Area is representative of the climate in metropolitan Phoenix, as well as of the southwestern one-third of Arizona. Different classification schemes for describing climate are in use. The schemes consider such climatologic conditions as temperature, wind, precipitation, humidity, and visibility. According to the Köppen classification

[3] For this classification, the difference between mean summer and mean winter temperatures must be greater than nine degrees Fahrenheit, at a depth of 20 inches, or at soil / bedrock interface.

[4] *Arizona Soils*, David M. Hendricks, College of Agriculture, University of Arizona, 1985

[5] *Soil Survey of Maricopa County, Arizona Central Part*, Soil Conservation Service, September, 1977.

system, Phoenix is classified as an arid subtropical climate.[6] The arid subtropical climate describes the climate of the southwestern one-third of Arizona.

**Table 1.2.4 Metropolitan Phoenix Meteorological Characteristics**[7]

| Month | Mean Monthly Temperature (in Degrees F) | Mean Monthly Rainfall (in Inches) | Mean Monthly Wind Speed (in Miles/Hour) | Monthly Wind Direction |
|---|---|---|---|---|
| **January** | 53.6° | 0.67” | 5.3 mph | E |
| **February** | 57.7° | 0.68” | 5.9 mph | E |
| **March** | 62.2° | 0.88” | 6.6 mph | E |
| **April** | 69.9° | 0.22” | 6.9 mph | E |
| **May** | 78.8° | 0.12” | 7.0 mph | E |
| **June** | 88.2° | 0.13” | 6.8 mph | E |
| **July** | 93.5° | 0.83” | 7.1 mph | W |
| **August** | 91.5° | 0.96” | 6.6 mph | E |
| **September** | 85.6° | 0.86” | 6.3 mph | E |
| **October** | 74.5° | 0.65” | 5.1 mph | E |
| **November** | 61.9° | 0.66” | 5.3 mph | E |
| **December** | 54.1° | 1.0” | 5.1 mph | E |
| **Annual** | 72.6° | 7.66" | 6.2 mph | E |

Source: *General Geographical and Climatological Summary* (http://geography.asu.edu.cerveny/wxpart1.html); the Western Regional Climate Center provided monthly mean wind speed and wind direction data (www.wrcc.dri.edu/)

Phoenix has two separate rainfall seasons. One season is represented by the winter months, November through March, when the valley is subject to storms from the Pacific Ocean. Light snow occasionally falls in the higher mountains surrounding the Salt River Valley. The other rainfall season, known as the “monsoon” season, occurs during the summer, especially, July and August. The remaining months generally are dry, but rainfall has been recorded during every month of the year.

During the summer, monsoon air masses swell north, starting at the Gulf of Mexico, Pacific Ocean, or West Coast of Mexico and Gulf of California. Unstable air moves into Arizona from the southeast over heated land surfaces and yields moderate afternoon or evening thunderstorms. This can occur when the Pacific high-pressure cell off the West coast moves northeast in late June and the southwestern region of the U.S. receives air flow from the Gulf of Mexico on the southwest side of a high pressure cell that protrudes from the Atlantic Ocean into the central part of the U.S. Because Arizona's monsoon air masses do not show typical monsoon frontal characteristics, Arizona's

[6] This climate zone encompasses one-third of southwestern Arizona, including the low valleys tributary to this region. The arid subtropical climate, represented by a January mean temperature greater than 32E F, is one of six different climatic types.

[7] In Table 1.2.4, temperature is shown in degrees Fahrenheit, and rainfall in inches per month. The monthly mean temperatures reflect 1961-1990 data. The mean monthly rainfall depicts 1896-1995 data.

monsoons are not as severe as elsewhere. Seasonal changes occur in the wind directions affecting Phoenix, from westerly to southerly wind, during July through early September. Thunderstorms can be intense at times creating heavy rain, destructive winds, blowing dust, and flash flooding. During these times, normally dry river channels can drain heavy rains.

April weather in the Phoenix area is normally very dry, and the monthly average rainfall total is the third driest of the year. Maximum daytime temperatures of 90° F or more are commonplace, and occasionally exceed 100° F. The evaporation rate is high. Dry local weather conditions combine with disturbed soil surfaces to cause the release of fugitive dust during high wind events, due to dry frontal passages. In these situations, eastward-moving, mid-latitude cyclones produce strong surface pressure gradients and associated strong winds aloft mix down to the surface, resulting in southwesterly to westerly winds in the 25 to 35 mph range. Since no rain and little if any cloud cover accompany these episodes, there is little moisture available to mitigate blowing and airborne dust particles.

The alluvial basin of the Salt River Valley is generally free of strong winds. In spring months, southwesterly and westerly winds predominate, associated with low-pressure troughs. During the summer rainy season, local, strong, gusty winds can occur with blowing dust, which may or may not be accompanied by rainfall. At that time, winds generally originate from the northeast to southeast, and very often, remain under ten miles per hour. The heat and lack of moisture experienced in Phoenix during the summer are conducive to the generation of airborne dust. During July and August, humidity increases and there can be afternoon and evening cloudiness associated with cumulus clouds over the mountains surrounding the Salt River Valley.

### 1.2.5 Population, Economy, and Land Use Data

The city of Phoenix is one of the fastest growing metropolitan areas in the U.S. The 2002 estimated population is 1,365,675. Since 1970, Phoenix has grown 126 percent, representing a numerical gain of 736,742 inhabitants. In 2000, Phoenix was ranked as the 6th largest city in the U.S.[8]

Arizona's climate and recreational venues have attracted many new residents, as well as tourists and winter visitors that spend part of their time living in metropolitan Phoenix. In 2000, the Phoenix-Mesa-Scottsdale Metropolitan Statistical Area (MSA), which is comprised of Maricopa and Pinal counties, ranked 14th in the U.S., for population.[9] The MSA contains 22 cities, once separate communities, that have coalesced to form the metropolitan area. According to Census 2000, Maricopa County gained the most number of people numerically, ranking it as the fourth largest county in the nation.

The Salt River Study Area is similar to other metropolitan areas, in that a variety of land uses and activities coexist. Land uses in the Salt River Study Area include: urban, and urban development: residential, commercial, government, educational, public cultural, and industrial. The development phase of these various urban land uses, at times, necessarily entails different types of vacant lands, either under construction, awaiting construction, or with construction in progress. Agriculture represents another land use noted in the Salt River Study Area. The area contains irrigated croplands used to cultivate: cotton, grains, alfalfa, sugar beets, pasture grasses, vegetables, citrus, and those used as pasture, and rangelands. The continuing, speedy growth of metropolitan Phoenix has resulted in a steady decline in the number of acres of land dedicated to agricultural

[8] U.S. Census Bureau, County and City Data Book 2000: Table C-1.
[9] U.S. Census Bureau, Census 2000 Redistricting Data (P.L. 94-171) Summary File, Internet release date, April 2, 2001.

use, over the past several decades. Between 1987 and 1997, agricultural land use in Maricopa County declined approximately 49 percent - from 1,391,456 acres used for agriculture, to 708,656 acres.[10]

The Department of Economic Security's projection series of 1997 indicates that the population of Phoenix will grow by 36 percent over the 2000 to 2020 period. Table 1.2.5 contains population projections in five-year intervals beginning with 2005. For reference, the 2000 Census counts and the 2002 mid-year population estimates are also included in Table 1.2.5, below.

**Table 1.2.5 Population Projections**

| Designation | 2000 Census | 2002 Estimate | 2005 Projection | 2010 Projection | 2015 Projection | 2020 Projection |
|---|---|---|---|---|---|---|
| **Phoenix-Mesa-Scottsdale MSA** | 3,251,876 | 3,488,645 | 3,511,048 | 3,909,281 | 4,317,999 | 4,747,319 |
| **Phoenix** | 1,321,045 | 1,365,675 | 1,415,330 | 1,544,093 | 1,641,489 | 1,795,539 |
| **State Total** | 5,130,632 | 5,472,750 | 5,553,849 | 6,145,108 | 6,744,754 | 7,363,604 |

Source: US. Census Bureau, Census 2000; Population Statistics Unit, Research Administration, Department of Economic Security (DES), Approved by Director August 1, 1997 and December 6, 2002.[11]

### 1.2.6 General SIP Requirements - The 1990 Clean Air Act Amendments (CAA)

*Clean Air Act § 110(l)*

Clean Air Act § 110(l), "[Implementation] Plan Revisions," requires that each revision to an implementation plan submitted by a state be adopted by the state after reasonable notice and public hearing. The Administrator shall not approve a revision of a plan if the revision would interfere with any applicable requirement concerning attainment and reasonable further progress (as defined in CAA § 171), or any other applicable requirement of this Act.

Arizona will implement the provisions of this SIP revision, as required by CAA § 110(l), after reasonable notice and public hearing, and commits to the continuing development of the appropriate state and local control measures for adoption and implementation that will promote attainment of the 24-hour $PM_{10}$ NAAQS in the Salt River $PM_{10}$ Study Area, and Maricopa County $PM_{10}$ Nonattainment Areas.

*Clean Air Act § 110(a)(2)(E)(i)*

Clean Air Act § 110(a)(2)(E)(i), "Implementation Plans," requires that state and/or local governments, and/or regional agencies, demonstrate to the Administrator that such entities will

[10] Arizona Agricultural Statistics Service, "2002 Arizona Agricultural Statistics Bulletin" (September 2003), "Census Farm Numbers and Land in Farms by County," page 6.
[11] Phoenix population projections approved by MAG Regional Council on June 25,1997.

have adequate personnel, funding, and authority under appropriate law, to carry out the subject implementation plan, or plan revision.

Arizona commits to working with other jurisdictions in the Maricopa County $PM_{10}$ Nonattainment Area, so that the resultant controls are affordable, efficient and necessary to address under-controlled sources of emissions.

*40 CFR §§ 51.280, and 51.111*

Subpart O of the Code of Federal Regulations, "Miscellaneous Plan Content Requirements," requires that state and local agencies, at implementation plan submission, include descriptions of the resources needed to carry out plan implementation during the five-year period following plan submission.

Arizona commits to describing the resources that will be necessary to carry out implementation of the plan provisions that state, county, and local jurisdictions eventually adopt and implement.

Subpart G of the Code of Federal Regulations, "Description of Control Measures," requires that each plan set forth a control strategy that includes a description of enforcement methods including, but not limited to: (1) procedures for monitoring compliance; (2) procedures for handling violations; and (3) a designation of agency responsibility for enforcement of implementation.

Arizona commits to the description of control strategy enforcement methods to be implemented when control strategy commitments are finalized and adopted by the various affected jurisdictions.

*Clean Air Act § 172(c)(1)*

Clean Air Act § 172(c)(1), "Nonattainment Plan Provisions," requires that, "…plan provisions shall provide for the implementation of all reasonably available control measures as expeditiously as practicable (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonably available control technology) and shall provide for attainment of the national primary ambient air quality standards."

SIP Chapter 4, and Appendix C, describe the proposed BACM/MSM control measures that Arizona has identified, and proposed implementation of, in the Salt River $PM_{10}$ Study Area, and for similar significant sources, throughout the Maricopa County $PM_{10}$ Nonattainment Area.

*Clean Air Act § 172(c)(2)*

Clean Air Act § 172(c)(2), "RFP," requires that plan provisions shall demonstrate Reasonable Further Progress (RFP) such that annual incremental reductions in emissions ensure attainment of the 24-hour NAAQS for $PM_{10}$ by the applicable attainment deadline. For the purposes of this SIP, the applicable deadline is December 31, 2006.

In Chapter 6, Arizona provides an RFP demonstration, as required by CAA § 172(c)(2), and in Chapter 4 and Appendix C, Arizona commits to the adoption of BACM/MSM controls to provide for attainment of the 24-hour NAAQS for $PM_{10}$ by the applicable attainment deadline.

The Revised *$PM_{10}$ State Implementation Plan for the Salt River Area*, which addresses general $PM_{10}$ control in the Salt River Study Area and the Maricopa County $PM_{10}$ Nonattainment Area, does not affect the Regional Transportation Plan or transportation conformity budget for $PM_{10}$. The $PM_{10}$ Regional Transportation Plan and transportation conformity budget represent on-road mobile

source emissions in the Maricopa County portion of the $PM_{10}$ Nonattainment Area, an area of about 2,850 square miles.

*Clean Air Act § 172(c)(3)*

Clean Air Act § 172(c)(3), "Inventory," requires that plan provisions, "…include a comprehensive, accurate, current inventory of actual emissions from all sources of the relevant pollutant or pollutants in such area, including such periodic revisions as the Administrator may determine necessary to assure that the requirements of this part are met."

Chapter 3, and the Technical Support Document (TSD) that accompany this SIP explain how ADEQ developed and maintains historical and current databases of actual emissions from Salt River $PM_{10}$ Study Area point and area sources, including those permitted by Maricopa County, the permitting authority in the Maricopa County $PM_{10}$ Nonattainment Area. Arizona also commits to periodic revisions as may be required by the EPA Administrator to assure that a comprehensive, accurate, and current inventory is maintained for the Salt River $PM_{10}$ Study Area.

*Clean Air Act § 172(c)(4)*

Clean Air Act § 172(c)(4), "Identification and Quantification," requires that state implementation plan provisions shall expressly identify and quantify the emissions of the pollutant or pollutants that will be allowed, in accordance with CAA § 173(a)(1)(B), from the construction and operation of major new or modified stationary sources in each area under review. The CAA requires that the plan shall demonstrate to the satisfaction of the Administrator that the emissions quantified for this purpose will be consistent with the achievement of reasonable further progress, and will not interfere with attainment of the applicable NAAQS, by the applicable deadline date.

This emissions inventory modeling for this SIP quantifies the reductions in current emissions required to achieve attainment of the 24-hour $PM_{10}$ NAAQS in the Salt River $PM_{10}$ Study Area. ADEQ commits to provide all appropriate future emissions inventories to quantify emissions allowable for any future sources of $PM_{10}$ emissions in the Salt River Study Area, and in Maricopa County Nonattainment Area.

*Clean Air Act § 172(c)(5)*

Clean Air Act § 172(c)(5), "Permits for New and Modified Major Stationary Sources," requires that the state implementation plan shall require permits for the construction and operation of new and modified major stationary sources throughout the nonattainment area.

All new sources and modifications to existing sources in Arizona are subject to state requirements for preconstruction review and permitting pursuant to Arizona Administrative Code (A.A.C.), Title 18, Chapter 2, Articles 1 through 5. All new and major sources and modifications to existing major sources in Arizona are subject to the New Source Review (NSR) provisions of these rules or Prevention of Significant Deterioration (PSD) for maintenance areas. The state NSR program was conditionally approved by EPA in1992, and is pending final approval. ADEQ currently has full approval of its Title V permit program.

*Clean Air Act § 172(c)(6)*

Clean Air Act § 172(c)(6), "Other Measures," requires that plans include enforceable emissions limitations and such other control measures, means or techniques, as well as schedule and

timetables for compliance, as necessary, consistent with the commitments for the adoption of BACM/MSM control measures.

Arizona commits to a program of enforceable emissions limitations and other control measures, means, techniques, schedules, and timetables for compliance, as necessary.

*Clean Air Act § 172(c)(7)*

Clean Air Act § 172(c)(7), "Compliance with Section 110(a)(2)," requires that plan provisions shall meet the applicable provisions of CAA § 110(a)(2). Arizona commits to demonstrating compliance with CAA § 110(a)(2), "State Implementation Plans."

*Clean Air Act § 172(c)(8)*

Clean Air Act § 172(c)(8), "Equivalent Techniques," requires that a plan use equivalent techniques, such as equivalent modeling, emission inventory, and planning procedures allowed by the Administrator, upon application by a state. No equivalent techniques were used in the development of this SIP.

*Clean Air Act § 172(c)(9)*

Clean Air Act § 172(c)(9), "Contingency Measures," requires that the plan provide for the implementation of specific measures to take effect without further action by the state or the Administrator in the event the area fails to make reasonable further progress or attain the primary national ambient air quality standards.

Chapter 6 of this SIP contains a review of the committed contingency measures that Arizona adopted in the *Revised MAG 1999 Serious area Particulate Plan for* $PM_{10}$ *for the Maricopa County Nonattainment Area* (1999/2000 MAG SIP or MAG SIP) (February 2000), and supports the 1999/2000 MAG SIP's contingency measure analysis that demonstrates attainment of the 24-hour and annual $PM_{10}$ NAAQS by December 31, 2006. ADEQ commits to the adoption and implementation of specific contingency measures to take effect in the event the area fails to make reasonable further progress or attain the primary NAAQS by December 31, 2006.

*Clean Air Act § 176(c)(1)(A)*

Clean Air Act § 176(c)(1)(A), "Limitations on Certain Federal Assistance," provides that no agency of the federal government shall provide assistance for, license, permit, or approve, any activity that does not conform to an implementation plan after its approval or promulgation under CAA § 110. Conformity with the purpose of a state implementation plan requires uniformity with the plan's purpose of eliminating or reducing the severity and number of violations of the NAAQS, and achieving expeditious attainment of the NAAQS.

Criteria for making determinations and provisions for general conformity as outlined in 40 CFR 93.153 can be located in A.A.C. R18-2-1438. There are no federal plans or actions adversely affecting $PM_{10}$ concentrations currently in the Maricopa County $PM_{10}$ Nonattainment Area, nor are any foreseen through year 2015.

*Clean Air Act §§ 191 and 192*

This SIP will be submitted in compliance with the deadlines specified in §§ 191 and 192.

*Clean Air Act §§ 188(e), and 188(f)*

Clean Air Act §188(e) provides that upon application by any state, the EPA Administrator may extend the attainment date for a serious $PM_{10}$ area beyond the date specified under CAA §188(c), if attainment by the deadline specified in § 188(c) would be impracticable, the state has complied with all requirements and commitments pertaining to that area in the implementation plan, and the state demonstrates to the satisfaction of the Administrator that the plan for that area includes the most stringent measures that are included in the implementation plan of any state, or are achieved in practice in any state, and can feasibly be implemented in the area.

On July 25, 2002, EPA granted Arizona's request to extend the CAA $PM_{10}$ serious area attainment deadline from December 31, 2001, to December 31, 2006 (67 FR 48718).

Clean Air Act §188(f) provides that the EPA Administrator may, on a case-by-case basis, waive any requirement applicable to any serious $PM_{10}$ area, where the Administrator determines that anthropogenic sources of $PM_{10}$ do not contribute significantly to the violation of the $PM_{10}$ standard in the area. The Administrator may also waive a specific date for attainment of the standard where the Administrator determines that nonanthropogenic sources of $PM_{10}$ contribute significantly to the violation of the $PM_{10}$ standard in the area.

Chapters 3, 4, and 5 of this SIP, and the TSD emissions inventory and modeling demonstrate that for a large part of the Salt River $PM_{10}$ Study Area, the predominant sources of $PM_{10}$ are anthropogenic, even on high-wind days. Due to the absence of nonanathropogenic source contributions in the Salt River Study Area, Arizona does not currently believe that basis for a CAA §188(f) waiver request exists.

*Clean Air Act §§ 189(b)(1)(A) and 189(b)(1)(B)*

Clean Air Act §189(b)(1)(A) and (B) set forth state implementation plan provisions for serious $PM_{10}$ nonattainment areas, requiring that the plan provides for attainment of the $PM_{10}$ NAAQS by the applicable attainment date, or that an extension is granted (see CAA §188(e), above).

Clean Air Act §189(b)(1)(B) requires that plan provisions for serious $PM_{10}$ nonattainment areas will assure that the Best Available Control Measures (BACM) for the control of $PM_{10}$ be implemented no later than four years after the date the area is classified (or reclassified) as a serious $PM_{10}$ area.

Arizona demonstrates, in SIP Chapter 4, and in the TSD, that Arizona has complied with the CAA requirement to implement BACM in the Maricopa County $PM_{10}$ Nonattainment Area, and submits a BACM/MSM analysis that identifies candidate measures for potential implementation. Arizona commits to implementing BACM/MSM measures that are feasible and cost-effective for implementation in the Nonattainment Area and will provide sufficient emissions reductions to promote $PM_{10}$ attainment as soon as practicable, but not later than December 31, 2006.

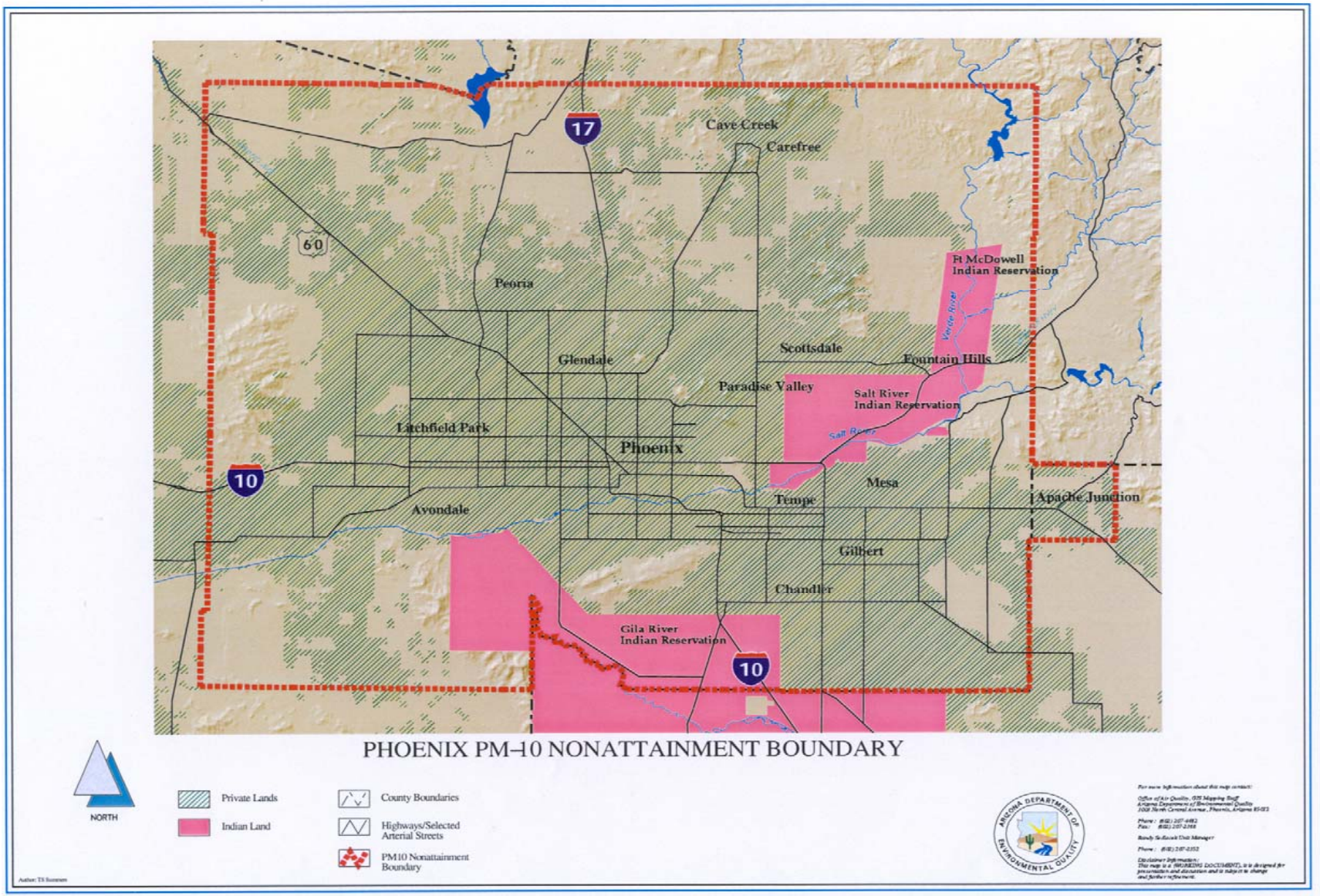


**Figure 1.2.3-A – The Maricopa County $PM_{10}$ Nonattainment Area**

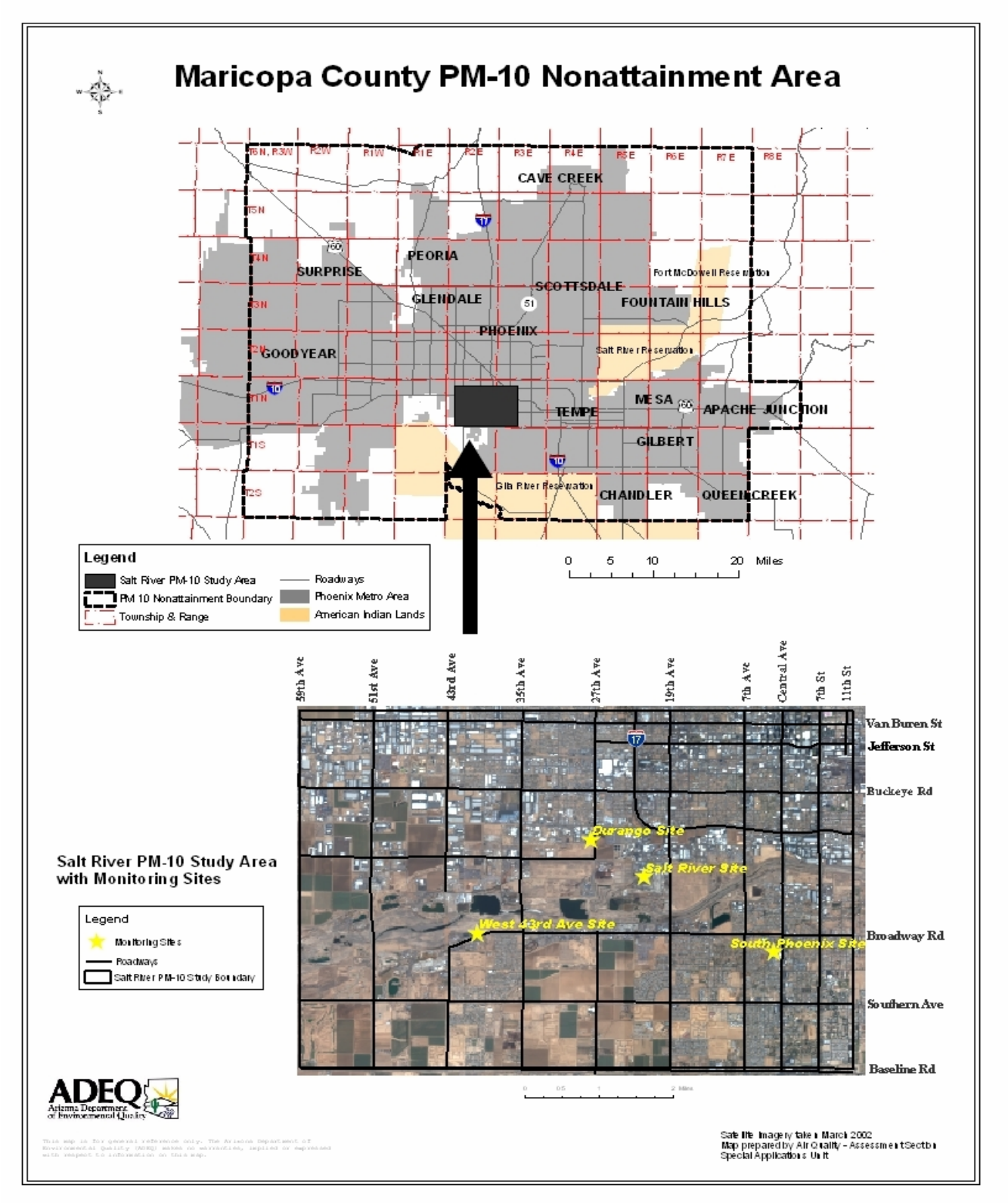


**Figure 1.2.3-B – The Salt River $PM_{10}$ Study Area**

# Chapter 2: AIR QUALITY MONITORING FOR PARTICULATE MATTER

## 2.1 INTRODUCTION

Section 110(a)(2)(C) of the 1990 CAA requires ambient air quality monitoring for the purposes of state implementation plan development. These requirements also address criteria for reporting air quality monitoring data to EPA. The purpose of this chapter is to present a general description of the Maricopa County $PM_{10}$ Nonattainment Area monitoring network, and of the monitoring network in the Salt River Study Area. This chapter details the historical $PM_{10}$ air quality data for the Salt River Study Area for years 1994 through 2002. Although EPA had approved the attainment and RFP demonstrations for the Salt River, Maryvale, Gilbert, and West Chandler air quality monitoring sites in ADEQ's microscale plan, *Plan for Attainment of the 24-Hour $PM_{10}$ Standard – Maricopa County $PM_{10}$ Nonattainment Area*, submitted May 9, 1997 (62 FR 41856, August 4, 1997), the Salt River monitoring site continued to measure violations of the 24-hour $PM_{10}$ standard, after the May 1998 attainment deadline. As a result of the continued violations, EPA issued a SIP call, requiring Arizona to submit a SIP revision to plan for attainment of the 24-hour $PM_{10}$ NAAQS in Maricopa County, and Salt River Study Areas (67 FR 44369, July 2, 2002).

## 2.2 $PM_{10}$ AIR QUALITY MONITORING NETWORK

The monitoring stations in the Maricopa County portion of the $PM_{10}$ Nonattainment Area were operated by: the Maricopa County Environmental Services Department, and the Arizona Department of Environmental Quality. In the Maricopa County Nonattainment Area, as at other Arizona monitoring sites, suspended particulate matter ($PM_{10}$ and $PM_{2.5}$), is usually sampled for 24 hours, from midnight to midnight, most often every-sixth-day. Ambient air is drawn through an inlet of a specified design, at a known flow rate, using a calibrated timer, onto a filter which collects all PM less than a diameter specified by the inlet design. $PM_{10}$, and $PM_{2.5}$ samples are processed in the same manner: those filters are weighed before and after the sample period to determine the difference in mass, and then integrated with flow rate and timer data to arrive at a mass per unit volume concentration. These data are then summarized into the appropriate quarterly or annual averages.

Common particulates instruments include the high-volume sampler (Hi-vol) and the dichotomous sampler (dichot). The dichotomous sampler measures both fine and coarse particulates. Particulates are also monitored continuously with a tapered element oscillating microbalance (TEOM) instrument.

### 2.2.1 Description of Salt River Study Area Monitors

Four $PM_{10}$ air quality monitoring sites have operated in the Salt River Study Area since 1994. (See Appendix A for historical $PM_{10}$ monitoring data.)

*The Salt River Site*

ADEQ and MCESD began operating the Salt River monitoring site on January 14, 1994. The Salt River monitoring site, a Special Purpose Monitor (SPM), was located at 3045 South 22nd Avenue, in a City of Phoenix vehicle maintenance yard, in an industrial area. The site had one, six-day, SS high-volume particulate monitor. The objectives of measurement at the site were to measure maximum concentrations, and determine the impact of significant sources or source categories.

The site was relocated within the property in January 2002, and discontinued altogether at the end of 2002, due to substantial construction on and near the property. As a result of efforts by MCESD, EPA, and ADEQ to find a suitable replacement site with comparable $PM_{10}$ concentrations and industrial emissions, a site was identified and established as the "West 43rd Avenue" site.

*The West 43rd Avenue Site*

MCESD began monitoring near West 43rd Avenue on April 1, 2002. The site is located at 3940 West Broadway Road (West 43rd Avenue and Broadway Road) in Phoenix, in a Maricopa County Department of Transportation storage lot. The monitoring objective of the site is to measure the maximum concentration of $PM_{10}$ and to determine the impact on ambient pollution levels of significant sources or source categories. The site has one, six-day SS high-volume particulate monitor. The site is surrounded by a combination of heavy industry, residential areas, and the river bottom. The industrial sources around the site include sand and gravel operations, auto and metal recycling, landfills, paved and unpaved haul roads, and cement casting.

*The Durango Complex Site*

The Durango Complex site, which began operating in the Salt River Study Area in 1999, is located at 2702 AC Esterbrook Boulevard, in the Maricopa County Flood Control District storage yard, near agriculture, the highway department and the river bottom. MCESD operates the State and Local Air Monitoring Station (SLAMS) site, which measures particulates, wind speed, and wind direction. The objective of use of the Durango site is measurement of maximum concentrations.

*The South Phoenix Site*

MCESD has operated the National Air Monitoring Station (NAMS) and SLAMS at the South Phoenix site since at least 1994. The site is located at 33 West Tamarisk, at Central and Broadway Roads, in a Phoenix residential area. The site borders commercial land use comprised of retail stores, food establishments, and office parks. The station represents two high population areas, north and west of the site. The criteria pollutants monitored at this station are carbon monoxide, ozone, and $PM_{10}$.

## 2.3 MARICOPA COUNTY HISTORICAL $PM_{10}$ AIR QUALITY DATA (1994 TO 2002)

The $PM_{10}$ concentrations presented in Appendix A show the historical data for all Maricopa County sites for the 24-hour $PM_{10}$ standard, from 1994 through 2002. The numbers represented in bold type indicate exceedances of the 24-hour $PM_{10}$ NAAQS.

# Chapter 3: $PM_{10}$ EMISSIONS INVENTORIES

## 3.1 INTRODUCTION

This chapter provides an overview of the methodology, assumptions and data for the Salt River Study Area $PM_{10}$ emissions inventory, specific data regarding which are found in the accompanying *Salt River $PM_{10}$ State Implementation Plan Technical Support Document* (TSD). The boundaries of the modeling domain are Van Buren Street on the north, Baseline Road on the south, 59th Avenue on the west and 10th Street on the east, - approximately 32 square miles. See TSD Appendix A for a satellite image of the study area with the locations of the four air quality monitors and depiction of the modeling grid (Map A-1). The base year emissions inventory captures 2002 $PM_{10}$ emissions, and the future year emissions inventory projects 2006 emissions.

Chapter 4 of the TSD also provides calculations reflecting gridded hourly emissions for four design days: January 8, 2002; April 15, 2002; April 26, 2002; and December 16, 2002. The design days were selected based on two separate meteorological constructs, each of which reflects different arrays of emissions sources and different levels of source significance: two days represent high $PM_{10}$ concentrations experienced during days affected by low wind conditions and a thermal inversion (January 8, and December 16, 2002); two days represent high $PM_{10}$ concentrations experienced during days affected by periodic wind speeds over 15 miles per hour (April 15, and April 16, 2002). Following are the four major $PM_{10}$ source categories developed for the purposes of this SIP:

- Point Sources – The point source category includes major stationary sources, defined as all facilities emitting greater than five tons per year (TPY) $PM_{10}$. Point source emissions include emissions from combustion, process operations, material transfers, storage pile wind erosion, and paved and unpaved roads within facility grounds.

- Area Sources – The area source category includes smaller anthropogenic stationary sources that are not included in the point source inventory, for example: small industrial facilities; agricultural tillage and harvesting; construction activity; and wind erosion of areas with disturbed topsoil, and considers $PM_{10}$ emissions from non-point, non-anthropogenic sources.

- On-Road Mobile Sources - The on-road mobile source category includes vehicles certified for highway use: cars, trucks, and motorcycles. Re-entrained road dust from paved and dust from unpaved roads are also considered.

- Off-Road Mobile Sources - The off-road mobile source category includes a wide variety of gasoline and diesel equipment that either move under their own power or can be moved from site to site, consisting of equipment not licensed or certified as highway vehicles and which will move or be moved at least once during a 12-month period. Off-road mobile sources include equipment used in agriculture; construction; mining; commercial and industrial operations; lawn and garden maintenance; aircraft; airport ground support; locomotives; railroad; recreational equipment; and water craft.

## 3.2 Salt River Study Base Year $PM_{10}$ Emissions Inventory (2002)

Technical Support Document Chapter 4, section 4.2, “Overview of Methodology,” presents an overview of the development of the base year emissions inventory for the Salt River SIP. The base

year emissions inventory was developed as the result of an extensive field study, conducted between June 1, and December 31, 2002. The study focused on identifying the locations of activities in the Salt River Study Area that generate fugitive dust. Satellite image analysis and observation of the Salt River Study Area resulted in the identification of the following general categories of $PM_{10}$ emissions sources, which were subsequently input into ADEQ's GRIDTEST emissions model for the development of source hourly emissions, by grid:

- Agricultural land;
- Alluvial channels;
- Construction areas;
- Miscellaneous disturbed, or open, areas;
- Paved primary roads
- Paved parking lots;
- Paved secondary roads;
- Unpaved roads;
- Unpaved road shoulders;
- Unpaved parking lots;
- Surface mining;
- Vacant lots.

TSD Chapter 4, section 4.2.1, "Satellite Image Analysis," provides a summary of the process by which the gridded hourly emissions data were developed. A satellite image of the Salt River Study Area with an overlay of the above land uses is found in Appendix A of the TSD (Map A-2). ADEQ's emissions inventory for the Salt River Study Area was developed from this data.

Between June 1 and December 31, 2002, ADEQ and Maricopa County Environmental Services Department staff collected additional observational data on fugitive dust in the Salt River Study Area. Chapter 4, section 4.2.2, "Fugitive Dust Study," of the TSD describes the process by which ADEQ conducted observations of the locations and activities, within the Salt River Study Area, associated with noted occurrences of fugitive dust. Although these observations did not constitute a comprehensive survey of land use in the Study Area, they provided a method of documenting area incidents of fugitive dust. These observations were superimposed on a satellite map of the Salt River Study Area, reviewed by teams of ADEQ observers, and grouped them into the following 12 emissions categories, for further analysis:

- Agriculture, including all general agricultural activities;
- Earthmoving, including general activities associated with construction;
- Trackout, including soil or bulk material on a paved street surface;
- Material handling, including vehicle traffic on dirt or gravel roads at construction, industrial, or commercial sites;
- Diesel exhaust, including exhaust from internal combustion engines that use diesel as fuel;
- Wind event, including airborne dust due to wind movement;
- Unpaved hauling, including vehicle traffic on dirt or gravel roads at construction at industrial or commercial sites;
- Process equipment, including mechanical equipment used to produce a product or perform a specific function that produces airborne dust;
- Unpaved parking, including vehicle traffic on unpaved parking areas;
- Burning, including open burning;
- Street work, including activities associated with street maintenance; and

- Other, which was a general category used to describe airborne dust not attributable to a specific fugitive dust source or sources.

Appendix A of the TSD (Map A-3) depicts the locations and types of fugitive dust-producing activities that were observed during the Salt River study. Figure 4-1 of the TSD contains a pie graph showing the relative contributions of the types of fugitive dust sources observed during the Fugitive Dust Study. Figures 4-2, 4-3, and 4-4 show: contributions attributed to vehicle material transport at construction and industrial sites; contributions attributed to trackout at construction, industrial, and private sources; and contributions attributed to unpaved hauling observations at industrial and construction sources, respectively.

Chapter 4, section 4.3 of the TSD, "Development of 24-Hour Emissions Inventory," describes the development of ADEQ's 24-hour emissions inventory, and TSD Chapter 4, section 4.4, "Summary of 2002 $PM_{10}$ Emissions Inventory," ranks the 2002 inventory sources by relative significance in the Salt River Study Area for the four design days. Figures 4-6, 4-7, 4-8, and 4-9 depict the Salt River Study Area $PM_{10}$ source categories by percentage contribution. Table 4-5 of the Technical Support Document (below, Table 3.2), identifies the 2002 Salt River $PM_{10}$ emissions inventory source categories and 2002 estimated $PM_{10}$ emissions for each.

**TABLE 3.2 - Salt River $PM_{10}$ Emissions Inventory - Year 2002 (Metric Tons per Day)**

| | **1/8/02** | **4/15/02** | **4/26/02** | **12/16/02** |
|---|---|---|---|---|
| | **Low Wind** | **High Wind** | **High Wind** | **Low Wind** |
| | Tuesday | Monday | Friday | Monday |
| **1. AREA SOURCES** | **0.11** | **114.34** | **114.34** | |
| Ag Tilling (Land Preparation) | 0.11 | | | |
| Wind Erosion – Agricultural | | 46.76 | 46.76 | |
| Wind Erosion – Construction | | 18.76 | 18.76 | |
| Wind Erosion - Cleared Areas | | 39.01 | 39.01 | |
| • Vacant lots | | 21.27 | 21.27 | |
| • Miscellaneous disturbed areas | | 17.74 | 17.74 | |
| Wind Erosion - Alluvial Channels | | 9.81 | 9.81 | |
| **2. INDUSTRIAL SOURCES** | **0.75** | **48.61** | **56.05** | **0.75** |
| MCESD Permitted Sources – Windblown Stockpiles | | 4.94 | 12.38 | |
| MCESD Permitted Sources – Windblown Cleared Areas | | 42.92 | 42.92 | |

| TABLE 3.2 - Salt River $PM_{10}$ Emissions Inventory - Year 2002 (Metric Tons per Day) | | | | |
|---|---|---|---|---|
| | **1/8/02** | **4/15/02** | **4/26/02** | **12/16/02** |
| MCESD Permitted Sources - Stacks | 0.27 | 0.27 | 0.27 | 0.27 |
| MCESD Permitted Sources – Process | 0.45 | 0.45 | 0.45 | 0.45 |
| MCESD Permitted Sources – Small | 0.03 | 0.03 | 0.03 | 0.03 |
| **3. NONROAD MOBILE SOURCES** | **0.85** | **0.84** | **0.84** | **0.84** |
| Agricultural Equipment Exhaust | 0.005 | | | |
| Construction Activity | 0.84 | 0.84 | 0.84 | 0.84 |
| **4. ONROAD MOBILE SOURCES** | **4.33** | **4.33** | **4.33** | **4.33** |
| **Paved Road** | | | | |
| Freeway – (subtotal)<br>Brakes, Tires, Exhaust, Reentrainment | 0.06 | 0.06 | 0.06 | 0.06 |
| Primary Roads | | | | |
| • Reentrained road dust | 2.95 | 2.95 | 2.95 | 2.95 |
| • Exhaust | 0.09 | 0.09 | 0.09 | 0.09 |
| • Brakes | 0.02 | 0.02 | 0.02 | 0.02 |
| • Tires | 0.01 | 0.01 | 0.01 | 0.01 |
| ***PRIMARY ROADS EMISSIONS SUBTOTAL*** | 3.07 | 3.07 | 3.07 | 3.07 |
| Secondary roads | | | | |
| • Reentrained road dust | 0.59 | 0.59 | 0.59 | 0.59 |
| • Exhaust | 0.02 | 0.02 | 0.02 | 0.02 |
| • Brakes | 0.004 | 0.004 | 0.004 | 0.004 |
| • Tires | 0.003 | 0.003 | 0.003 | 0.003 |
| ***SECONDARY ROADS EMISSIONS SUBTOTAL*** | 0.62 | 0.62 | 0.62 | 0.62 |
| **Paved Road Total Emissions** | **3.69** | **3.69** | **3.69** | **3.69** |
| **5. TRACKOUT** | **0.66** | **0.66** | **0.66** | **0.66** |

| TABLE 3.2 - Salt River $PM_{10}$ Emissions Inventory - Year 2002 (Metric Tons per Day) | | | | |
|---|---|---|---|---|
| | **1/8/02** | **4/15/02** | **4/26/02** | **12/16/02** |
| **6. UNPAVED SHOULDERS & PARKING LOTS** | **0.133** | **0.133** | **0.133** | **0.133** |
| Unpaved Road Shoulders | 0.13 | 0.13 | 0.13 | 0.13 |
| Unpaved Parking Lots - Reentrained dust | 0.003 | 0.003 | 0.003 | 0.003 |
| ***$PM_{10}$ EMISSIONS - GRAND TOTAL*** | ***6.25*** | ***168.43*** | ***175.87*** | ***6.14*** |

### 3.3 Salt River Study Future Year $PM_{10}$ Emissions Projections (2006)

The following emissions source categories in the Salt River $PM_{10}$ Study Area are projected to show a change in emissions between Year 2002 and Year 2006:

- *Agricultural Tillage.* The amount of agricultural land, and emissions from agricultural tillage, are projected to decrease 80% due to conversion of agricultural land to residential and commercial uses.

- *Construction Activity.* MCESD estimated the overall control effectiveness for the control measures for construction activity for year 2002 to be 56 percent based on a 90-percent control efficiency, an 80-percent compliance rate, and an adjustment to reflect future test method improvements. Emissions from construction activity are projected to decrease in coming years, to increase the rule effectiveness for this category from 56 percent to 72 percent.

- *Roads – Freeway, Primary, and Secondary.* Traffic is projected to increase by six percent between 2002 and 2006, based on the growth in traffic volumes in the Salt River Study Area, which occurred between 1998 and 2002. Since there are no plans for road-building projects in the Salt River PM10 Study Area, this estimate of VMT growth, 1.5 percent per year, based on a MAG analysis of City of Phoenix traffic counts, is consistent with the central location and older neighborhoods characteristic of the study area.

- *Unpaved Parking Lots.* Emissions from unpaved parking lots greater than 0.10 acres are projected to decrease due to MCESD strengthening Rule 310 to increase the rule effectiveness for this category from 55% to 71%.

- *Unpaved Road Shoulders*. Unpaved road shoulders in the study area have decreased by 10 percent since 2002, due to completion of road shoulder stabilization projects. Thus, the amount of emissions from road shoulders has also decreased by 10 percent.

- *Wind Erosion – Agricultural.* The amount of agricultural land, and emissions from wind erosion of agricultural land, are projected to decrease 80% due to conversion of agricultural land to residential and commercial uses (Maricopa County Farm Bureau, 2003 and ADEQ analysis).

- *Wind Erosion – Construction*. Emissions from wind erosion of disturbed areas due to construction are projected to attain 70 percent by 2006.

- *Wind Erosion – Vacant Lots and Miscellaneous Disturbed Areas*. The amount of vacant lots and misc. disturbed areas is projected to decrease 13.6% due to conversion of vacant lots and misc. disturbed areas to residential and commercial uses. ADEQ estimated the decrease in vacant lots and misc. disturbed areas would parallel the conversion of agricultural land to residential and commercial uses (URS and ERG, 2001). In addition, MCESD is strengthening Rule 310 to increase the rule effectiveness for this category from 55% to 71%.

Table 4-7 of the TSD (below, Table 3.3) reflects 2006 base case projected emissions for each of the design days:

**TABLE 3.3 - Salt River $PM_{10}$ Emissions Inventory - Base Case 2006 (Metric Tons / Day)**

| | **1/8/06*** | **4/15/06*** | **4/26/06*** | **12/16/06*** |
|---|---|---|---|---|
| | **Low Wind** | **High Wind** | **High Wind** | **Low Wind** |
| | Tuesday* | Monday* | Friday* | Monday* |
| **1. AREA SOURCES** | **0.02** | **50.34** | **50.34** | |
| Ag Tilling (Land Preparation) | 0.02 | | | |
| Wind Erosion – Agricultural | | 9.35 | 9.35 | |
| Wind Erosion – Construction | | 15.20 | 15.20 | |
| Wind Erosion - Cleared Areas | | 21.57 | 21.57 | |
| • Vacant lots | | 11.76 | 11.76 | |
| • Miscellaneous disturbed areas | | 9.81 | 9.81 | |
| Wind Erosion - Alluvial Channels | | 4.22 | 4.22 | |
| **2. INDUSTRIAL SOURCES** | **0.75** | **48.61** | **56.05** | **0.75** |
| MCESD Permitted Sources – Windblown Stockpiles | | 4.94 | 12.38 | |
| MCESD Permitted Sources – Windblown Cleared Areas | | 42.92 | 42.92 | |
| MCESD Permitted Sources - Stacks | 0.27 | 0.27 | 0.27 | 0.27 |
| MCESD Permitted Sources – Process | 0.45 | 0.45 | 0.45 | 0.45 |
| MCESD Permitted Sources – Small | 0.03 | 0.03 | 0.03 | 0.03 |

| TABLE 3.3 - Salt River $PM_{10}$ Emissions Inventory - Base Case 2006 (Metric Tons / Day) | | | | |
|---|---|---|---|---|
| | **1/8/06*** | **4/15/06*** | **4/26/06*** | **12/16/06*** |
| **3. NONROAD MOBILE SOURCES** | **0.54** | **0.54** | **0.54** | **0.54** |
| Agricultural Equipment Exhaust | 0.004 | | | |
| Construction Activity | 0.54 | 0.54 | 0.54 | 0.54 |
| **4. ONROAD MOBILE SOURCES** | **4.19** | **4.19** | **4.19** | **4.19** |
| **Paved Road** | | | | |
| Freeway – Brakes, Tires, Exhaust, Reentrainment | 0.07 | 0.07 | 0.07 | 0.07 |
| Primary Roads | | | | |
| • Reentrained road dust | 3.19 | 3.19 | 3.19 | 3.19 |
| • Exhaust | 0.10 | 0.10 | 0.10 | 0.10 |
| • Brakes | 0.02 | 0.02 | 0.02 | 0.02 |
| • Tires | 0.01 | 0.01 | 0.01 | 0.01 |
| ***PRIMARY ROADS SUBTOTAL*** | 3.32 | 3.32 | 3.32 | 3.32 |
| Secondary roads | | | | |
| • Reentrained road dust | 0.64 | 0.64 | 0.64 | 0.64 |
| • Exhaust | 0.02 | 0.02 | 0.02 | 0.02 |
| • Brakes | 0.004 | 0.004 | 0.004 | 0.004 |
| • Tires | 0.003 | 0.003 | 0.003 | 0.003 |
| ***SECONDARY ROADS SUBTOTAL*** | 0.67 | 0.67 | 0.67 | 0.67 |
| **Paved Road Total Emissions** | **4.06** | **4.06** | **4.06** | **4.06** |
| **5. TRACKOUT** | **0.66** | **0.66** | **0.66** | **0.66** |
| **6. UNPAVED SHOULDERS & PARKING LOTS** | **0.133** | **0.133** | **0.133** | **0.133** |
| Unpaved Road Shoulders | 0.13 | 0.13 | 0.13 | 0.13 |
| Unpaved Parking Lots - Reentrained dust | 0.003 | 0.003 | 0.003 | 0.003 |
| ***$PM_{10}$ EMISSIONS - GRAND TOTAL*** | ***6.16*** | ***104.47*** | ***111.91*** | ***6.14*** |
| *** Theoretical design days in year 2006 that have identical meteorological conditions, time of year, and** | | | | |

| TABLE 3.3 - Salt River $PM_{10}$ Emissions Inventory - Base Case 2006 (Metric Tons / Day) | | | | |
|---|---|---|---|---|
| | 1/8/06* | 4/15/06* | 4/26/06* | 12/16/06* |
| day of week to the four design days in year 2002 emissions inventory and modeling. | | | | |

As discussed earlier in this chapter, source categories and their relative significance in the emissions inventory of the Salt River Study Area varied with changes in meteorology: design days with low wind speeds featured a different combination of emission sources than were reflected for the design days with high wind speeds. The design days with high wind speeds had additional emission sources related to wind erosion of disturbed soil, especially with respect to the wind erosion of agricultural and alluvial channel areas.

The most significant source categories projected for 2006 for low and high wind days were:

**TABLE 3.4 – Base Case 2006 Salt River $PM_{10}$ Emissions Inventory - Significant Sources for Low Wind and High Wind Days**

| LOW WIND DAYS | | HIGH WIND DAYS | |
|---|---|---|---|
| Primary Paved Roads | 53.97% | Wind Erosion – Industrial | 39.79% |
| Industrial Sources | 12.19% | Wind Erosion – Cleared Areas | 20.00% |
| Secondary Paved Roads | 10.89% | Wind Erosion – Construction | 14.10% |
| Trackout | 10.73% | Wind Erosion - Agricultural | 8.67% |
| Construction Activity | 8.78% | Wind Erosion – Stockpiles | 7.91% |
| Unpaved Road Shoulders | 2.09% | On-Road Mobile | 4.43% |
| | | Wind Erosion – Alluvial Channels | 3.92% |

# Chapter 4: $PM_{10}$ CONTROL MEASURES

## 4.1 INTRODUCTION

Chapter 1.2.2 of this SIP ("Regulatory History of the Metropolitan Maricopa $PM_{10}$ Nonattainment Area") notes that on July 25, 2002, EPA approved the Maricopa Serious $PM_{10}$ Nonattainment Area, and granted Arizona's request, in accordance with CAA § 188(e), to extend the CAA deadline for attainment of the annual and 24-hour $PM_{10}$ standards from December 31, 2001, to December 31, 2006 (67 FR 48718).

Because the attainment deadline for this plan revision is also December 31, 2006, and the measures must be applied to all similar sources throughout the Phoenix Nonattainment Area (see 67 FR 44369, July 2, 2002), the control strategies must meet the "Most Stringent Measures" test, as well as the “Best Available Control Measures/Technology” test. In its July 25, 2002, approval of the Maricopa County Plan, EPA defined “most stringent measures” (MSMs) as the most stringent measures included in any state implementation plan, or being implemented in any state, that are economically and technologically feasible for the nonattainment area in question. “Best Available Control Measures” (BACM) must be applied in serious nonattainment areas, also taking into account the economic and technological feasibility of each measure.

This chapter details the proposed BACM and MSM that were evaluated for each significant source category.

## 4.2 SOURCE CATEGORIES

The Salt River Study Area 2002 base year emissions inventory is described in Chapter 3.0 and the TSD’s Chapter 4.0. The 2002 emissions source category contributions to ambient $PM_{10}$ are depicted in Table 4.2.1. The average concentrations are derived from the modeled concentrations outlined in the TSD, Chapter 6.

**Table 4.2.1 2002 Salt River Study Area Source Category Contributions to Ambient $PM_{10}$ Concentrations**

| Source Category | Average Low Wind Day Contribution | Average High Wind Day Contribution | Highest Contribution ($\mu g/m^3$) | |
|---|---|---|---|---|
| | Percentage Contribution | Percentage Contribution | Low Wind Day | High Wind Day |
| **Industrial Sources** | 25.9% | 8.3% | **60.2** | **31.8** |
| Point Emissions | 2.7% | 1.1% | **5.3** | 3.0 |
| Area Emissions | 23.2% | 7.2% | **54.9** | **28.8** |
| | | | | |
| **Construction** | 5.8% | 0.9% | **6.0** | 4.4 |
| | | | | |
| **Area Sources** | 4.2% | 0.7% | **8.0** | 3.1 |
| Unpaved Parking Lots | 1.7% | 0.2% | 0.8 | 1.4 |
| Unpaved Shoulders | 2.5% | 0.4% | **7.2** | 1.7 |
| | | | | |
| **Roads & Trackout** | 63.7% | 13.5% | **73.6** | **42.7** |
| Freeway | 0.4% | 0.2% | 0.7 | 0.4 |
| Primary Roads | 43.6% | 9.3% | **44.8** | **33.3** |
| Secondary Roads | 7.5% | 1.5% | **6.9** | 1.5 |
| Trackout | 12.1% | 2.5% | **21.2** | **7.5** |
| | | | | |
| **Agricultural Tillage** | 0.4% | NA | 0.2 | NA |
| | | | | |
| **Windblown Dust** | NA | 76.7% | NA | **290.1** |
| Agricultural Fields | NA | 21.3% | NA | **84.9** |
| Alluvial Channels | NA | 14.9% | NA | **79.5** |
| Construction | NA | 3.5% | NA | **14.0** |
| Industrial | NA | 7.3% | NA | **33.6** |
| Disturbed Areas | NA | 5.2% | NA | **25.9** |
| Stockpiles | NA | 3.6% | NA | **12.6** |
| Vacant Lots | NA | 20.9% | NA | **39.6** |

Note: Bold concentrations exceed the 5 $\mu g/m^3$ threshold for significant sources.

In Table 4.2.2, the modeled contributions for each of the source categories are given for the 2006 attainment case. These percentages are similar to the 2002 case, but with several significant differences. For example, the windblown contribution decreases from 77% to 59% from 2002 to 2006.

**Table 4.2.2 Salt River Study Area Source Category Contributions to Ambient $PM_{10}$ Concentrations for the 2006 Attainment Case**

| Source Category | Average Low Wind Day Contribution | Average High Wind Day Contribution |
|---|---|---|
| | Percentage Contribution | Percentage Contribution |
| **Industrial Sources** | 29.7% | 12.1% |
| Point Source Emissions | 4.4% | 3.1% |
| Area Emissions | 25.2% | 8.9% |
| | | |
| **Construction** | 5.2% | 1.8% |
| | | |
| **Area Sources** | 7.1% | 2.1% |
| Unpaved Parking Lots | 0.5% | 0.6% |
| Unpaved Shoulders | 6.6% | 1.5% |
| | | |
| **Roads & Trackout** | 58.0% | 24.7% |
| Freeway | 0.9% | 0.4% |
| Primary Roads | 48.3% | 21.6% |
| Secondary Roads | 6.8% | 1.9% |
| Trackout | 2.0% | 0.7% |
| | | |
| **Agricultural Tillage** | 0.1% | NA |
| | | |
| **Windblown Dust** | NA | 59.4% |
| Agricultural Fields | NA | 8.9% |
| Alluvial Channels | NA | 15.4% |
| Construction | NA | 4.2% |
| Industrial | NA | 6.7% |
| Disturbed Areas | NA | 10.1% |
| Stockpiles | NA | 5.9% |
| Vacant Lots | NA | 8.4% |

## 4.3 BACM AND MSM CONTROL MEASURES FOR SIGNIFICANT SOURCE CATEGORIES

### 4.3.1 BACM and MSM Analysis

EPA provided guidance regarding the requirements of CAA § 188(e) in its July 25, 2002, approval of the *Revised MAG 1999 Serious Area Particulate Plan for* $PM_{10}$ *for the Maricopa County Nonattainment Area* (67 FR 48718), and in its more recent proposed approval of the *Clark County*

$PM_{10}$ *Implementation Plan* (68 FR 2954, January 22, 2003). For the 24-hour standard, BACM must be applied to source categories contributing at least 5 $\mu g/m^3$, the same threshold used for the New Source Review program. In its approval of the Phoenix plan, EPA commented that states should focus on the controls most likely to result in real air quality benefits and not use limited resources on controls with trivial impacts (see page 67 FR 48721). The threshold for which sources MSM must be applied is the same (see page 67 FR 48722).

BACM and MSM are required for all sources that exceed the 5 $\mu g/m^3$ threshold level, however, the economic and technical feasibility of potential controls also must be considered. Because of varying factors, such as the mix of sources, including nonanthropogenic sources, population exposure, and availability of controls, the set of control measures must be individualized for the specific conditions in each nonattainment area.

Identifying potential BACM and MSM controls involves researching controls in other areas . The Arizona Department of Environmental Quality (ADEQ) and Maricopa County Environmental Services Department (MCESD) began with the analyses performed for the MAG and Clark County Plans, then researched and added additional $PM_{10}$ controls proposed in other SIPs or being implemented by other jurisdictions. These include: Coachella Valley, California; South Coast Air Quality Management District, California; Washoe County, Nevada; Mohave Desert Air Quality Management District, California; San Joaquin Valley Unified Air Pollution Control District, California; Texas Commission on Environmental Quality; Florida Department of Environmental Protection; Bay Area Quality Management District, California; and Oklahoma Department of Environmental Quality.

### 4.3.2 Significant Source Categories

The source categories exceeding the significance threshold of 5 $\mu g/m^3$ are:

***Area Sources***

Windblown emissions from construction, agriculture, open areas and vacant lots, and the Salt River alluvial channel;

***Permitted Industrial Sources***

Emissions from industrial point sources, industrial area sources, windblown cleared areas, and stockpiles; and

***On-Road Mobile Sources***

Emissions from paved roads including primary and secondary roads, trackout, and unpaved shoulders.

Construction activity, although significant, has been left out of the above list and the following discussion. Its omission stems from EPA's finding that County Rule 310 already qualifies as BACM/MSM.

### 4.3.3 Area Source Control Measures

***Windblown Construction***

*Background*

Emissions in this category originate from wind erosion of topsoil that has been disturbed by earthmoving activities related to construction.

*Potential Control Measures*

The potential control measure is better enforcement of MCESD Rule 310 pertaining to the control of fugitive dust. In 2003, the U.S. Environmental Protection Agency (US EPA) conditionally approved Rule 310 as BACM contingent upon the completion of 3 commitments by MCESD: 1) research and develop standards and test methods for earthmoving sources that are enforceable and meet BACM requirements on stringency and source coverage; 2) incorporate additional requirements for dust suppression practices/equipment for construction activities into dust control plans and/or Rule 310; and 3) revise sample daily recordkeeping logs for new and renewed Rule 310 permits to be consistent with rule revisions and to provide sufficient detail documenting the implementation of dust control measures required by Rule 310 and the dust control plan.

MCESD met the first commitment by amending Appendix C of the MCESD Air Pollution Control Regulations which outlines test methods used for fugitive dust observations. MCESD established test methods for non-continuous and continuous plumes from dust generating operations. To meet the second commitment, MCESD revised dust control permit applications to more clearly request the information that is required in order to evaluate chosen control measures. MCESD met the final commitment by revising sample record keeping logs and making them widely available to regulated sources and the public. MCESD also clarified the recordkeeping requirements listed in Rule 310, Section 500, to reflect the changes to the sample forms. On April 7, 2004, the Maricopa County Board of Supervisors adopted the required enhancements to Rule 310.

The methods available under enhanced Rule 310 to control windblown dust emissions from disturbed areas include opacity restrictions, the use of water or dust suppressants, and the installation of wind barriers. Temporary measures to be implemented during weekends, after work hours, on holidays or high wind events include applying water, dust suppressants, or gravel, and restricting vehicular access.

*Rule Compliance / Test Methods / Record Keeping*

Rule Compliance, Test Methods, and Record Keeping can be found in MCESD Rule 310. A critical aspect of strengthening enforcement of the Rule 310 control measures listed above is the hiring of additional inspectors for the program (this includes resources for the enforcement of Rules 310.01 for open areas and vacant lots and Rule 316 pertaining to industrial sources). In 1998, MCESD had four inspectors, one supervisor, and one enforcement officer on staff to enforce 1,700 earthmoving permits. In 2000, MCESD increased the number of personnel working on Rule 310 (“Fugitive Dust”) compliance to eight inspectors, one supervisor, one coordinator, two enforcement officers, one aide, and one County attorney. In 2000, MCESD was responsible for 2,500 earthmoving permits. Currently, MCESD is responsible for 4,150 earthmoving permits.

By September 2004, the MCESD will complete three work load analyses. The first analysis will focus on three to five inspections per year at earthmoving sites ten acres or larger in size, and one inspection per year at smaller sites for compliance with Maricopa County Rule 310. The second analysis will focus on inspections of 5,300 vacant lots per year, which constitutes 20 percent of the 26,446 vacant lots identified as of October 2003, for compliance with Maricopa County Rule 310.011 (“Fugitive Dust from Open Area, Vacant Lots, Unpaved Parking Lots, and Unpaved Roadways”).

The third analysis will focus on increasing inspection for compliance with Maricopa County Rule 316 ("Non-Metallic Mineral Mining and Processing") to four times per year. The workload analysis will also address proposed enforcement for Maricopa County's proposed Rule 325, which will provide $PM_{10}$ controls for structural clay and brick manufacturers.

These analyses are expected to result in identification of the number of additional personnel and salaries/fringe benefits totals necessary for an effective enforcement effort to attain the $PM_{10}$ standard. Interim funding to enable accelerated hiring of some additional personnel will also be explored an identified by September, 2004. A resolution committing Maricopa County to a funding mechanism and specified number of enforcement positions to be added and filled in 2004-2005 will be presented to the Maricopa County Board of Supervisors for adoption for its September meeting. Following adoption of the resolution, Maricopa County will hire additional personnel in the October 2004 through September 2005 timeframe. In the interim, Maricopa County will revise fees through revisions to Maricopa County Rule 280 to fund the additional positions. MCESD has scheduled an initial public workshop on fees for September 16, 2004 at 9: a.m.

***Windblown Cleared Areas (Open Areas, Vacant Lots, and the Alluvial Channel)***

*Background*

Windblown dust from open areas and vacant lots can be a major source of $PM_{10}$ emissions. As high winds pass over open areas and vacant lots, particulate emissions are generated by a process called the saltation effect, where large particles begin to roll and then bounce, knocking smaller particles into the wind stream. Windblown dust emissions from open areas and vacant lots can be produced for many hours at a time when the wind speed exceeds the wind erosion threshold speed of 15 mph.

A special case of windblown emissions from open areas and vacant lots is emissions from disturbed soils in the Salt River alluvial channel. The alluvial channel is mostly dry and contains loose soil due to disturbance from wind erosion and vehicular trespass.

*Potential Control Measures*

The potential control method is better enforcement of MCESD Rule 310.01 pertaining to fugitive dust control on open areas and vacant lots. Rule 310.01 control measures for reducing windblown particulate matter emissions from open areas, vacant lots, and the alluvial channel can be grouped into three categories: soil stabilization, barriers to trespassing, and wind breaks.

*Soil stabilization* methods include establishing a vegetative ground cover on disturbed areas, restoring disturbed surface areas such that the vegetative ground cover and soil characteristics are similar to adjacent or nearby native conditions, applying a dust suppressant to disturbed surface areas, and uniformly applying and maintaining surface gravel, river rock, or broken concrete debris on disturbed surface areas.

*Barriers to trespassing* prevent vehicles from having access to open areas and vacant lots. These include concrete and rock barriers, fences, ditches, berms, and posting no trespassing signs. Barriers and signage are necessary for law enforcement to respond to trespassing complaints.

*Wind breaks* reduce surface wind speeds to below the reentrainment emission threshold of 15 miles per hour. These include chain link fences with inserts, walls, and planting of trees and shrubs. Wind breaks are not currently a control method option in MCESD Rule 310.01 and would require a revision of Rule 310.01.

*Emission Reductions*

For the Year 2002, $PM_{10}$ emissions from open areas and vacant lots in the Salt River $PM_{10}$ Study Area were estimated to be 17.7 metric tons/day for open areas and 21.3 metric tons/day for vacant lots. This daily emission rate is based on $PM_{10}$ emissions due to wind erosion on high wind days and a control measure efficiency of 55 percent for MCESD's Rule 310.01.

For the Year 2006, $PM_{10}$ emissions from open areas and vacant lots in the Salt River $PM_{10}$ Study Area were estimated to be 9.8 metric tons/day for open areas and 11.8 metric tons/day for vacant lots. The daily emission rates are based on $PM_{10}$ emissions due to wind erosion on high wind days and an increased control measure efficiency from 55 percent to 71 percent for MCESD's Rule 310.01. The projected reduction in $PM_{10}$ emissions results from not only the better enforcement of Rule 310.01 but also from the conversion of open areas and vacant lots to residential and commercial uses. Converted land has lower windblown $PM_{10}$ emissions due to stabilization of the soil from landscaping, paving, and the buildings themselves.

Based on the MCESD Rule Effectiveness Study and the Clark County, Nevada $PM_{10}$ SIP, Table 4.3.3.1 shows emission reduction percentages that could be achieved assuming that MCESD hires additional inspectors to strengthen the enforcement of MCESD's Rule 310.01 for open areas and vacant lots. This increased enforcement is expressed in the table as 80% Rule Effectiveness. The table also presents emission reductions from several different control measures that involve either stabilizing the surface or creating barriers to trespassing, or both.

In the heading of the table, the phrase "without any additional controls" means that quantity of emissions that would occur with the 2002 level of enforcement.

For the Year 2002, $PM_{10}$ emissions from the alluvial channel were estimated to be 9.8 metric tons/day due to wind erosion on high wind days. This baseline estimate is based on the assumption that there was no enforcement of MCESD Rule 310.01 in that portion of the alluvial channel.

For the Year 2006, $PM_{10}$ emissions from the alluvial channel were estimated to range from 2.8 to 7.5 metric tons/day depending upon the types of control measures that may be implemented.

**Table 4.3.3.1 – Open Areas and Vacant Lots Control Measures (Year 2006 $PM_{10}$ emissions without additional controls equals 21.57 metric tons/day)**

| Control measures | Rule Effectiveness | Control Efficiency | Total Control Efficiency | Open Areas and Vacant Lots – $PM_{10}$ Emissions After Controls (Metric tons / day) |
|---|---|---|---|---|
| Establish a vegetative cover | 80% | 45% | 36% | 13.80 |
| Restore to nearby native vegetation | 80% | 45% | 36% | 13.80 |
| Apply dust suppressant | 80% | 40% | 32% | 14.67 |
| Apply gravel | 80% | 75% | 60% | 8.63 |
| Create barriers to trespassing | 80% | 30% | 24% | 16.39 |
| Establish wind breaks | 80% | 40% | 32% | 14.67 |
| Establish a vegetative cover with barriers to trespassing | 80% | 90% | 72% | 6.04 |
| Restore to nearby native vegetation with barriers to trespassing | 80% | 90% | 72% | 6.04 |
| Apply dust suppressant with barriers to trespassing | 80% | 80% | 64% | 7.77 |

Based on MCESD's Rule Effectiveness Study and the Clark County, Nevada $PM_{10}$ SIP, the emissions reductions percentages shown in Table 4.3.3.2 can be achieved, assuming that MCESD hires additional inspectors to strengthen enforcement of MCESD's Rule 310.01 for open areas and vacant lots. This table also shows emissions reductions from combining control measures with the Create Barriers to Trespassing control measure.

For the majority of the control measures above for open areas, vacant lots, and the alluvial channel to remain effective, vehicular trespassing must be minimized through the use of barriers to trespassing. Otherwise, vehicular traffic will destroy/disturb vegetative cover and the other surface treatments used to stabilize the soil, including the installation of wind breaks.

*Rule Compliance / Test Methods/ Record Keeping*

Rule Compliance, Test Methods, and Record Keeping can be found in MCESD Rule 310.01. As described above for windblown construction emissions, a critical aspect of strengthening enforcement of the Rule 310 control measures is the hiring of additional inspectors for the entire program.

*Technical Feasibility*

Following is a discussion of the technical feasibility of various means of stabilizing ground surfaces, reducing soil erodability and barring trespassing.

> ***Establishing a Vegetative Ground Cover*.** Establishing a vegetative ground cover is technically feasible. The choice of ground cover would be up to the individual property

owner. The availability of water for establishing the ground cover, and possibly maintaining it, would be possible constraints. For the Salt River alluvial channel, water in the lakes located in some of the rock product facilities is a potential source of nearby water for establishing a vegetative cover. Transferring water from the lakes would require coverage under an AZPDES general permit.

**Table 4.3.3.2 – Alluvial Channel Control Measures**
**(Uncontrolled Emissions = 9.81 Metric Tons Per Day On High Wind Days)**

| Control measures | Rule Effectiveness | Control Efficiency | Total Control Efficiency | Alluvial Channels After Controls (Metric tons / day) |
|---|---|---|---|---|
| Establish a vegetative cover | 80% | 45% | 36% | 6.28 |
| Restore to nearby native vegetation | 80% | 45% | 36% | 6.28 |
| Apply dust suppressant | 80% | 40% | 32% | 6.67 |
| Apply gravel | 80% | 75% | 60% | 3.92 |
| Apply river rock | 80% | 70% | 56% | 4.32 |
| Apply broken concrete debris | 80% | 70% | 56% | 4.32 |
| Establish wind breaks | 80% | 40% | 32% | 6.67 |
| Create barriers to trespassing | 80% | 30% | 24% | 7.46 |
| Establish a vegetative cover with barriers to trespassing | 80% | 90% | 72% | 2.75 |
| Restore to nearby native vegetation with barriers to trespassing | 80% | 90% | 72% | 2.75 |
| Apply dust suppressant with barriers to trespassing | 80% | 80% | 64% | 3.53 |
| Establish wind breaks with barriers to trespassing | 80% | 80% | 64% | 3.53 |

***Restoring to Similar Vegetative and Soil Conditions of Adjacent or Nearby Native Areas.*** This control measure is technically feasible. The choice of ground cover would be up to the individual property owner. The availability and cost of water for establishing the ground cover, and possibly maintaining it, would be constraints. As described above for the Salt River alluvial channel, water in the lakes located in some of the rock product facilities is a potential source of nearby water for establishing a vegetative cover. Transferring water from the lakes would require coverage under an AZPDES general permit.

***Applying Dust Suppressant.*** Dust suppressants are readily available and would work to reduce wind erosion of open areas and vacant lots. A constraint on the use of dust suppressants in the alluvial channel is potential surface and ground water contamination. Dust suppressants can also possibly be washed away when water is released from dams upstream.

***Applying Gravel*.** Gravel can be used to cover disturbed portions of open areas and vacant lots to prevent wind erosion. For the alluvial channel, gravel can be used to cover some, but not all areas because gravel may sink into those portions of the channel containing fine silt.

***Applying River Rock.*** River rock can be used as a control measure for the Salt River alluvial channel. The rock can be mined from some areas of the channel and then spread on the most unstable soils in the channel. This control measure assumes that there is an adequate supply of river rock.

***Applying Broken Concrete from Construction Debris.*** Broken concrete and asphaltic pavement can be used as control measures for the alluvial channel. Both are included in the A.R.S. § 49-201.19 definition of inert material.

***Creating Barriers to Trespassing*.** Barriers to trespassing are effective, but need to be constructed correctly. If barriers do not completely limit access to open areas, vacant lots, and the alluvial channel trespassers will probably find a way around the barriers and disturb the soil treatment used to stabilize the disturbed soil. A necessary deterrent to trespassing is the placement of "No Trespassing" signs. Law enforcement agencies require the presence of signs as a pre-condition to prosecuting trespassers. The combination of barriers and signage is effective in reducing trespassing if there is adequate patrolling and enforcement of the area by police officers.

***Establishing Wind Breaks.*** The effectiveness of trees and bushes as wind breaks is dependent on the height, density and the orientation of the wind break to the prevailing winds. The same is true for the effectiveness of walls and modified chain link fences used as wind breaks. This measure would require a revision to Rule 310.01, since wind breaks are not listed as a control measure in this rule.

*Economic Feasibility*

***Establishing a Vegetative Ground Cover.*** It is feasible to establish vegetative cover as a means of stabilizing soil and creating a boundary layer that will prevent wind erosion. Two general approaches can be taken: planned landscaping and establishment of "native" vegetation (may include exotic species that are well adapted to ambient temperature and precipitation). Ideally, one would be seeking a minimum of broadly spaced shrubs, (e.g. creosote bush, acacia, saltbush, and desert broom) mixed with forbs (e.g., fairy duster and rosemary), herbaceous groundcovers (e.g., sand verbena, four o' clocks and crane's bill) and grasses. Planned landscaping may require continued maintenance and permanent irrigation systems, unless xeriscaping techniques and plants are used. Drip irrigation systems cost about $1,500 per acre, with total costs in the range of $16,000 to $21,000 per acre. The least expensive option is reestablishing native vegetation, which requires no maintenance beyond the first year. The costs of this option are not known at this time. Regardless, xeriscaping and reestablishment of native vegetation requires irrigation for the first year to stabilize soils and allow plants to become established. All vegetative cover options require restricting access to be successful.

***Restoring to Similar Vegetative and Soil Conditions of Adjacent or Nearby Native Areas.*** See above discussion regarding establishing vegetative ground cover. The least expensive option is reestablishing native vegetation, which requires no maintenance beyond

the first year. The costs of this option are not known at this time. Regardless, xeriscaping and reestablishment of native vegetation requires irrigation for the first year to stabilize soils and allow plants to become established. All vegetative cover options require restricting access to be successful.

***Applying Dust Suppressant.*** The effectiveness of applying a dust suppressant is directly related to the dilution rate, number of applications, frequency of application, and traffic. The cost range of $9,680 - $12,100 per acre is based on preparing the surface, applying two to four applications of the dust suppressant, and compacting the surface. If a customer prepares the surface, including pre-moistening of the surface and provides on-site water, the cost of a single application dust suppressant could be as little as $1,000 per acre.

***Applying Gravel.*** Gravel, crushed river rock or crushed granite can be applied as a control measure for disturbed soils. One ton of 3/8-inch crushed river rock would cover 100 square feet, 2 inches deep. An acre would require about 435 tons of rock. The price range of $9,888 - $10,803 per acre includes a contractor spreading cost of $9.00 per ton. Actual costs vary depending on the size of the project and job conditions.

***Applying River Rock.*** This control measure applies to the Salt River alluvial channel. River rock in the channel can be excavated, hauled short distances, and placed on unstable areas of the channel. Costs are estimated at approximately $4,000 per day for two excavators, two ten-wheeler trucks, and a water truck. This scenario assumes moving 100 cubic yards per hour of rock at a cost of $4.00 - $5.00 per cubic yard of rock moved. It is estimated that 800 cubic yards of river rock can be excavated and spread at a cost of $4,000 per day per acre.

***Creating Barriers to Trespassing.*** Three types of barriers to trespassing were considered: a concrete or highway barrier, a chain link fence with either a top rail or top tension wire, and boulders.

Concrete barriers are available locally in lengths of 12.5 feet or 20 feet. The 12.5 foot barrier, which weighs 5,300 pounds, has a 32-inch height, a 24-inch base, and a 6-inch top. The maximum price, depending on the number ordered, is $100 per 12.5 foot barrier, delivered and set in place. That translates into $8.50 per linear foot or $2,550 for 100 linear yards.

Chain link fence is typically constructed of 9 gauge steel, and is 6 feet high with a top railing. It is installed with concrete posts placed 10 feet apart. A typical cost range is $11.00 - $13.00 per linear foot. That translates into $3,300 - $3,900 for 100 linear yards. Some savings could be realized if a top tension wire were used instead of a top railing.

The cost estimate for installing rock barriers is based on a hypothetical design of not less than five large boulders, with the largest boulders ranging in weight from 400 - 600 pounds each, placed in alignment two to three feet apart. The approximate weight per 24-foot section is 1.15 - 1.3 tons at a cost of $161 - $182. An additional cost of $1,700 was added for setting the rock barriers in place. This results in a linear foot cost of $7.00 - $7.90. The actual cost could be higher depending on the variability of boulder size. This may result in a greater weight range for boulders and hence a higher overall cost based on weight. Rock barriers, with a space of two to three feet between boulders, may not prevent trespassing by dirt bikes.

Increased law enforcement is needed in conjunction with barriers to effectively prevent trespassing. The cost of hiring off-duty enforcement officers is $35.00 per hour per officer. Two officers per vehicle are required. The cost for a patrol car is $4.00 per hour plus $0.70 per mile. Shifts are 7 hours long and average about 35 miles. For calculating the annual cost of additional law enforcement, 234 shifts were used for an annual total of 1,638 hours. Based on this scenario, the cost for the enforcement officers is $114,660 annually. The vehicle cost is $12,285, or 1,638 hours at $4.00 per hour and 234 shifts of 35 miles times $0.70 per mile. The total cost is $126,945.

***Establishing Wind Breaks.*** Another feasible alternative is to cover chain link fencing with a mesh screen. The cost range for constructing a wind-break fence is the same for chain link fencing plus a $2.00 per linear foot cost for adding the mesh screen. Thus, the $13.00 - $15.00 per linear foot translates into $3,900 - $4,500 for 100 linear yards.

The spacing and placement of wind breaks is critical. However, this option may not be realistic because of the cost and the great number of wind breaks required. Other options for creating wind breaks could be employed, such as piling rocks or building small hills. The effectiveness and costs associated with these options are unknown.

Table 4.3.3.3 presents the estimated costs for control measures to be applied to open areas and vacant lots in the Salt River $PM_{10}$ Study Area. It is assumed that approximately 13.6 percent of the vacant lots, and 39 percent of the open areas, will be converted to residential and commercial use between Year 2002 and Year 2006.

**Table 4.3.3.3 – Estimated Cost for Control Measures (dollars) – Open Areas and Vacant Lots**

| Control Measure | Cost per Acre | Cost per Linear Foot | Total Acres | Total Linear Feet* | Total Cost |
|---|---|---|---|---|---|
| Establish a vegetative cover | 16,000 – 21,000 | N/A | 2,065 | | $33,040,000 – $43,365,000 |
| Restore to nearby native vegetation | 16,208 – 21,732 | N/A | 2,065 | | $33,469,520 – $44,876,580 |
| Apply dust suppressant | 9,680 – 12,100 | N/A | 2,065 | | $19,989,200 – $24,986,500 |
| Apply gravel | 9,888 – 10,803 | N/A | 2,065 | | $20,418,720 –$22,308,195 |
| Establish mechanical wind breaks<br>- chain link fencing with mesh | | 13.00 – 15.00 | | 523,915 | $6,810,895 – $7,858,725 |
| Create barriers to trespassing<br>- chain link fencing<br>- concrete barrier<br>- boulders<br>- law enforcement | law enforcement: ($70/hr for 2 officers + $4/hr for car + $0.70/mile | 11.00 – 13.00<br>8.50<br>7.00 – 8.00 | | 523, 915 | $5,763,065 – $6,810,895<br>$4,453,278<br>$3,667,405 – $4,138,929<br>$126,945 |
| Establish a vegetative cover with barriers to trespassing | 16,000 – 21,100 | 7.00 – 13.00 | 2,065 | 523,915 | $36,707,405 – $50,382,395 |
| Restore to nearby native vegetation with barriers to trespassing | 16,208 – 21,732 | 7.00 – 13.00 | 2,065 | 523,915 | $37,136,925 – $51,687,475 |
| Apply dust suppressant with barriers to trespassing | 9,680 – 12,100 | 7.00 – 13.00 | 2,065 | 523,915 | $23,656,605 – $31,797,395 |

Table 4.3.3.4 presents the estimated costs for control measures to be applied to unstable areas of the Salt River alluvial channel.

| Table 4.3.3.4 - Estimated Cost for Control Measures (dollars) – Alluvial Channel | | | | | |
|---|---|---|---|---|---|
| **Control Measure** | **Cost per Acre** | **Cost per Linear Foot** | **Total Acres** | **Total Linear Feet*** | **Total Cost** |
| Establish a vegetative cover | 16,000 – 21,000 | N/A | 153 | | $2,448,000 – $3,213,000 |
| Restore to nearby native vegetation | 16,208 – 21,732 | N/A | 153 | | $2,479,824 - $3,324,996 |
| Apply dust suppressant | 9,680 – 12,100 | N/A | 153 | | $1,481,040 – $1,851,300 |
| Apply gravel | 9,888 – 10,803 | N/A | 153 | | $1,512,864 – $1,652,859 |
| Apply river rock | 4,000 | N/A | 153 | | $612,000 |
| Apply broken concrete debris | 425 – 567 | N/A | 153 | | $65,025 – $86,751 |
| Establish mechanical wind breaks<br>- chain link fencing with mesh | | 13.00 – 15.00 | | 173,190 | $2,251,470 – $2,597,850 |
| Create barriers to trespassing<br>- chain link fencing<br>- concrete barrier<br>- boulders<br>- additional law enforcement | law enforcement: ($70/hr for 2 officers + $4/hr for car + $0.70 per mile) | 11.00 – 13.00<br>8.50<br>7.00 – 8.00 | | 5,000 | $55,000 – $65,000<br>$42,500 – $42,500<br>$35,000 – $39,500<br>$126,945 |
| *Establish a vegetative cover with barriers to trespassing | 16,000 – 21,000 | 7.00 – 13.00 | 153 | 5,000 | $2,483,000 – $3,278,000 |
| *Restore to nearby native vegetation with barriers to trespassing | 16,208 – 21,732 | 7.00 – 13.00 | 153 | 5,000 | $2,483,000 - $3,278,000 |
| *Apply dust suppressant with barriers to trespassing | 9,680 – 12,100 | 7.00 – 13.00 | 153 | 5,000 | $1,516,040 – $1,916,300 |
| *Establish mechanical wind breaks with barriers to trespassing | | 13.00 – 15.00,<br>7.00 – 13.00 | | 173,190<br>+ 5,000 | $2,286,470 – $2,662,850 |
| * Barriers to Trespassing control measures should be combined with additional law enforcement to effectively reduce trespassing. Additional law enforcement would add $126,945 per year to the Barriers to Trespassing control measures. | | | | | |

| Table 4.3.3.5 - Estimated Cost-Effectiveness – Open Areas and Vacant Lots | | | |
|---|---|---|---|
| **Control Measure** | **Emissions Reduced on High Wind Days (metric tons/day)*** | **Total Cost** | **Cost-Effectiveness per Ton $PM_{10}$ Reduced ($ per ton reduced for 6 wind events)** |
| Establish a vegetative cover | 7.77 | $33,040,000 – $43,365,500 | $708,709 – $930,191 |
| Restore to nearby native vegetation | 7.77 | $33,469,520 – $44,876,580 | $717,922 – $962,604 |
| Apply dust suppressant | 6.90 | $19,989,200 – $24,986,500 | $482,831 – $603,539 |
| Apply gravel | 12.94 | $20,418,720 – $22,308,195 | $262,992 – $287,329 |
| Establish mechanical wind breaks<br>- chain link fencing with mesh | 6.90 | $6,810,895 – $7,858,725 | $164,514 – $189,824 |
| Create barriers to trespassing<br>- chain link fencing<br>- concrete barrier<br>- boulders<br>- additional law enforcement | 5.18 | $5,763,065 – $6,810,895<br>$4,453,278<br>$3,667,405 – $4,138,929<br>$126,945 | $185,427 – $219,141<br>$143,284<br>$117,999 – $133,170<br>---- |
| **Establish a vegetative cover with barriers to trespassing | 15.53 | $36,707,405 – $50,382,395 | $393,941 – $540,700 |
| **Restore to nearby native vegetation with barriers to trespassing | 15.53 | $37,136,925 – $51,687,475 | $398,550 – $554,706 |
| **Apply dust suppressant with barriers to trespassing | 13.80 | $23,656,605 – $31,797,395 | $285,708 – $384,027 |
| * One wind event<br>**Barriers to Trespassing control measures should be combined with additional law enforcement to effectively reduce trespassing. Additional law enforcement would add $126,945 per year to the Barriers to Trespassing control measures. | | | |

Table 4.3.3.6 presents the estimated costs and cost-effectiveness for control measures required to stabilize the 153 acres of disturbed soils in the alluvial channel. For the year 2002, $PM_{10}$ emissions were estimated to be 9.8 metric tons/day.

| Table 4.3.3.6 - Estimated Cost-Effectiveness – Alluvial Channel | | | |
|---|---|---|---|
| **Control Measure** | **Emissions Reduced on High Wind Days (metric tons / day) *** | **Total Cost ($)** | **Cost-Effectiveness per Ton $PM_{10}$ Reduced ($ per ton reduced for 6 wind events)** |
| Establish a vegetative cover | 3.53 | $2,448,000 – $3,213,000 | $115,581 – $151,700 |
| Restore to nearby native vegetation | 3.53 | $2,479,824 - $3,324,996 | $117,083 - $156,988 |
| Apply dust suppressant | 3.14 | $1,481,040 – $1,851,300 | $78,611 – $98,264 |
| Apply gravel | 5.89 | $1,512,864 – $1,652,859 | $42,809 – $46,770 |
| Apply river rock | 5.49 | $612,000 | 18,579 |
| Apply broken concrete debris | 5.49 | $65,025 – $86,751 | $1,974 – $2,634 |
| Establish mechanical wind breaks<br>- chain link fencing with mesh | 3.14 | $2,251,470 – $2,597,850 | $119,505 – $137,890 |
| Create barriers to trespassing<br>- chain link fencing<br>- concrete barrier<br>- boulders<br>- additional law enforcement | 2.35 | $55,000 – $65,000<br>$42,500 – $42,500<br>$35,000 – $39,500<br>$126,945 | $3,901 – $4,610<br>$3,014 – $3,014<br>$2,482 – $2,801<br>---- |
| **Establish a vegetative cover with barriers to trespassing | 7.06 | $2,483,000 - $3,278,000 | $58,617 – $77,384 |
| **Restore to nearby native vegetation with barriers to trespassing | 7.06 | $2,514,824 - $3,389,996 | $59,368 - $80,028 |

| | | | |
|---|---|---|---|
| **Apply dust suppressant with barriers to trespassing | 6.28 | $1,516,040 – $1,916,300 | $40,235 – $50,857 |
| **Establish mechanical wind breaks with barriers to trespassing | 6.28 | $2,286,470 – $2,662,850 | $60,681 – $70,670 |
| * One wind event<br>** Barriers to Trespassing control measures should be combined with additional law enforcement to effectively reduce trespassing. Additional law enforcement would add $126,945 per year to the Barriers to Trespassing control measures. | | | |

*Auxiliary Advantages/Disadvantages*

***Establishing a Vegetative Ground Cover.*** Establishing a vegetative ground cover would reduce soil loss due both to wind erosion and water erosion. Additional benefits include providing wildlife habitat and lowering of summertime temperatures due to shading of the soil by vegetation.

***Restoring to Similar Vegetative and Soil Conditions of Adjacent or Nearby Native Areas.*** See benefits above of establishing vegetative cover.

***Applying Dust Suppressant.*** A disadvantage of applying dust suppressants in the Salt River alluvial channel is the potential leaching of chemicals from the suppressant into storm water or ground water.

***Applying Gravel.*** A disadvantage of applying gravel to the wildcat roads in the alluvial channel is that it may provide easier access with the associated subsequent disturbance of stabilized areas.

***Applying River Rock.*** This measure would give a natural appearance to the alluvial channel.

***Applying Broken Concrete from Construction Debris.*** This measure may reduce or eliminate illegal motor vehicle traffic in the alluvial channel. In addition, this measure would reduce the amount of construction debris entering landfills.

***Creating Barriers to Trespassing.*** This measure would reduce illegal dumping.

***Establishing Wind Breaks.*** Wind breaks enhance the control effectiveness of the vegetative cover and dust suppressant control measures listed above.

*BACM/MSM Analysis*

MCESD Rule 310.01 Fugitive Dust from Open Areas, Vacant Lots, Unpaved Parking Lots, and Unpaved Roadways:

***§ 301 Vehicle Use in Open Areas and Vacant Lots.*** Requires implementation of one of the following control measures for open areas and vacant lots 0.10 acre or larger (4,356 square feet) that have a cumulative area of 500 square feet or more that are driven over and/or used by motor vehicles and/or off-road vehicles:

- Prevent motor vehicle and/or off-road vehicle trespassing, parking, and/or access, by installing barriers, curbs, fences, gates, posts, signs, shrubs, trees, or other effective control measures.

- Uniformly apply and maintain surface gravel or chemical/organic stabilizers to all areas disturbed by motor vehicles and/or off-road vehicles.

***§ 302 Open Areas And Vacant Lots.*** Requires implementation of one of the following control measures within 60 calendar days following the initial discovery of the disturbance for open areas and vacant lots that have 0.5 acre or more (21,780 square feet) of disturbed surface area and remain unoccupied, unused, vacant, or undeveloped for more than 15 days:

- Establish vegetative ground cover on all disturbed surface areas
- Apply a dust suppressant to all disturbed surface areas
- Restore all disturbed surface areas such that the vegetative ground cover and soil characteristics are similar to adjacent or nearby undisturbed native conditions.
- Uniformly apply and maintain surface gravel

*Similar Rules*

Following are summaries of similar rules for control measures applicable to open areas, vacant lots, and alluvial channels:

***Clark County, Nevada – Section 90.2.1(a) & (b).*** Owner/operator required to implement controls for open areas and vacant lots 5,000 square feet or larger, such as:

- Prevent motor vehicle access and stabilize disturbed surface stabilize disturbed surface greater than 5,000 square feet with gravel or dust palliatives.
- Stabilize disturbed surface greater than 5,000 square feet with gravel or dust palliatives.

***Clark County, Nevada - Clark County June 2001, $PM_{10}$ SIP, Appendix L, p. L-11.***

- Commitment to hire ten new enforcement department staff members to implement enforcement for "wind erosion – vacant land, unpaved parking and race tracks"

***Coachella Valley, California - Final 2002 Coachella Valley $PM_{10}$ SIP, June 2002.*** Owners/operators of vacant lands with disturbed surfaces greater than or equal to 5,000 square feet are required to either (proposed, revised dust control ordinance):

- Prevent trespass by installing physical barriers such that a surface crust is developed, or
- Treat the disturbed surfaces such that a surface crust is formed. Treatment options include uniform application and maintenance of two

inches of washed gravel or chemical/organic dust suppressants to all disturbed areas at a level sufficient to develop and maintain a surface crust.

When an owner/operator has applied physical access restrictions and an acceptable surface crust has not been established, treatment of disturbed vacant lands with greater than or equal to 5,000 square feet will be required unless such treatments are considered technically infeasible.

***SCAQMD, California - 403(d)(1).*** Disturbed areas must be controlled to prevent visible emissions from crossing the property line. Disturbed Surface Areas/Inactive Construction Site BACM from the Rule 403 Implementation Handbook:

- Chemical stabilization – Most effective when used on areas where active operations have ceased.
- Watering – Requires frequent applications unless a surface crust can be developed.
- Wind fencing – Three- to five-foot barriers with 50% or less porosity adjacent to roadways or urban areas can be effective in reducing the amount of windblown material leaving a site. Must be used in conjunction with either measure Chemical Stabilization, Watering, or Vegetation.
- Vegetation – Establish as quickly as possible when active operations have ceased.
- High Wind Measures - Apply chemical stabilizers (to meet the specifications established by the Rule); or apply water to all disturbed surface areas 3 times per day.

***San Joaquin Valley Air Quality Control District $PM_{10}$ SIP, 2003, Rule 8051.*** Owners of open areas with more than three acres of disturbed surfaces that remain vacant or unused for more than seven days are required to implement one or a combination of control measures (watering, vegetation, paving, gravel, vehicle restrictions) to maintain a stabilized surface and limit visible dust emissions to no more than 20 percent opacity.

*Selected Control Measures for Open Areas, Vacant Lots, and the Alluvial Channel*

The selected control measure for windblown dust from open areas and vacant lots is better enforcement and augmentation of MCESD Rule 310.01 pertaining to the control of fugitive dust. Current control options include establishing/restoring vegetative cover, applying gravel, river rock, broken concrete, or dust suppressants, and creating barriers to trespassing. A recommended augmentation to Rule 310.01 is the addition of wind breaks as a control measure. The most significant control method appears to be the stabilization of soils and barriers to prevent vehicular trespassing.

***Windblown Agricultural***

Windblown $PM_{10}$ emissions from agricultural fields originate from tilling and harvesting practices and wind erosion of disturbed topsoil in the time period between harvesting and when a crop is tall enough to act as a wind break. The quantity of $PM_{10}$ that is generated is closely linked to the management of soils and the amount of mechanical disturbance. Soil disturbance changes soil structure by breaking up aggregates and allowing particles smaller than 10 µm in size to be easily suspended in the air by wind.

A wide range of variation in soils and cropping systems exists within Maricopa County, which necessitates a wide range of flexible and adaptable management practices. Most methods for controlling $PM_{10}$ and dust emissions from agricultural fields parallel the controls for wind erosion. These methods are based on principles that contain or slow soil movement from fields. Measures to minimize soil disturbance and the entrainment of topsoil into the air by wind are discussed below.

The Governor's Agricultural Best Management Practices (BMPs) Committee was formed to evaluate options for reducing $PM_{10}$ emissions from agricultural sources. A BMP is defined as a technique verified by scientific research that, on a case-by-case basis, is practical, economically feasible, and effective in reducing $PM_{10}$ from a regulated agricultural activity. BMPs are not designed to eliminate dust emissions 100 percent, but are expected to reduce wind erosion and associated $PM_{10}$. BMPs were developed for each of the three agricultural categories: tillage and harvest, non-cropland, and cropland.

The Agricultural BMP program has been approved by EPA as BACM/MSM (see 67 FR 48718, July 25, 2002). Consequently, no further changes are proposed. Additional outreach to farmers will occur to encourage them to use practices that will reduce the potential for windblown dust from fields during the month of April.

### 4.3.4 Permitted Industrial Source Control Measures

Industrial sources with a variety of particulate matter emissions are located throughout the Salt River SIP Study Area. These emissions are categorized into four groups: windblown stockpiles, windblown cleared areas, industrial point sources, and industrial area sources including emissions from material handling, processes, and driving on haul roads. Considering the application of control technologies in accordance with permit requirements, the total emissions generated by the industrial sources in the Salt River SIP Study Area are approximately 1,054,000 pounds per year, based on actual emissions reported in the MCESD 2002 emissions inventory and on independent calculations of windblown emissions based on six high-wind days with four hours of high wind per day in a year. Table 4.3.4.1 shows the daily breakdown of emissions by category for the high wind day of April 15, 2002.

| Table 4.3.4.1 – Industrial Source Emissions by Category | |
|---|---|
| **Category** | **Particulate Emissions tons/day** |
| Windblown Stockpiles | 4.9 |
| Windblown Cleared Areas | 42.9 |
| Industrial Point Source | 0.3 |
| Industrial Area Source | 0.5 |
| Total | 48.6 |

The following is a partial list of the industrial activities evaluated in the Salt River SIP Study Area: aluminum melting, brick kilns, asphalt batch plants, concrete batch plants, mulch manufacturing, steel fabrication, sand and gravel mining, furniture manufacturing, concrete block manufacturing, and wastewater treatment. Emissions from all of these types of facilities were included in the emissions inventory and the air quality modeling.

Although point source (stack) emissions are 38% of the total industrial emissions (not including windblown), the better dispersion from taller stacks diminishes their effect on air quality. For example, for only one of the eight exceedances were stack emissions significant, as opposed to six significant concentrations for industrial area emissions. Within the industrial area category, the combination of haul roads, material transfer, pile forming and loading, and crushing & screening accounts for 91% of the total. Most of these emissions come from sand & gravel operations and their kindred industries, sometimes known as the "non-metallic mineral products industry."

All industrial sources in the Salt River SIP Study Area were evaluated for compliance with BACM/MSM. Only those sources that did not meet BACM/MSM were evaluated further. Because industrial sources are significant, the vast majority of these emissions come from the non-metallic mineral products industry, and the current controls on this industry warranted further evaluation, most of the emphasis for the industrial source control measures is on the non-metallic mineral products processing industry.

**Non-Metallic Mineral Products Processing**

Several aspects of non-metallic mineral products processing were evaluated separately: stack and process related emissions for crushing and screening, concrete and asphalt batch plants; windblown cleared areas; stockpiles; and unpaved haul and access roads.

***Stack and Process Related Emissions***

*Background*

The production, processing and use of various non-metallic minerals products generate particulate emissions in the form of dust. Quite often, as in the case of rock crushing or screening, the dust is identical in composition to the material being handled. Emissions occur also from handling and storing the finished products because this material is often fine and dry. Particulate emissions from some of the processes such as quarrying, yard storage, and dust from transport are difficult to control, but most can be reduced by conventional emission reduction techniques. Due to the wide variety in processing equipment and final products, emissions levels can vary greatly.

There are several types of facilities that generate particulate matter emissions as a result of performing non-metallic mineral processing activities. These activities include, but are not limited to aggregate screening, transferring aggregate to elevated storage bins, weigh hopper loading, aggregate transfer to conveyor belts, aggregate delivery to ground storage, and bulk loading of material into trucks.

The $PM_{10}$ emissions from non-metallic mineral processing plants that are of particular concern are uncontrolled non-stack emissions. These are emissions that are a result of processing non-metallic mineral products that do not have an identified stack. Examples of such emission points include screens, crushers, storage bins and hoppers, conveyor belts, drop points, and loading trucks.

*Potential Control Measures.*

The following are control measures for reducing particulate matter emissions from non-metallic mineral processing plants:

***Work Practice Standards.*** Work practice standards can include timing of activities and methods of operation used at a facility that will reduce emissions.

***Complete Enclosure.*** An emissions source can be completely enclosed by relocating the source from outside to inside a building or by constructing an enclosure around it, thereby preventing emissions to the atmosphere. Emissions sources that can be controlled by this method include plant feeding, handling, crushing, and screening operations; concrete batch plant mixer loading and concrete batch truck loading; sand/aggregate transfer to conveyors and other areas; transit mix trucks loading; and materials transfer points.

***Partial enclosure.*** Partial enclosures partially cover the emission point, thereby reducing partially, but not completely, particulate emissions to the atmosphere. Partial enclosures can be in the form of sheds, hoods, or shrouds. Emission sources that can be controlled by this method include plant feeding, handling, crushing, and screening operations; pile forming; load out; concrete batch plant mixer loading and transit mix truck loading; concrete batch truck loading; sand/aggregate transfer to conveyors and other areas; and material transfer points.

***Baghouse Filtration System.*** Baghouse filtration systems can be used in two ways: 1) a baghouse fabric filter can be attached to the exhaust of a bin or silo vent or 2) a ducting system with a suction shroud can be constructed to draw process emissions into a baghouse fabric filter. Emissions sources that can be controlled by these methods include screening operations; aggregate transfer to elevated bins; weigh hopper loading; aggregate transfer to conveyors; aggregate delivery to ground storage; crushing and shredding of scrap metal; materials transfer points; and bulk loading of material into trucks.

***Dust suppressants.*** The use of dust suppressants involves spraying some type of chemical coating on aggregate raw materials either before processing or during transportation, for example, on conveyor belts. Emissions sources that can be controlled by this method include plant feeding, handling, and crushing operations; concrete batch plant mixer loading and concrete batch truck loading; sand/aggregate transfer to conveyors and other areas; transit mix truck loading; and materials transfer points.

*Emission Reductions*

When applying the control measures described above to the Non-Metallic Mineral Products Processing source category, the emissions reductions shown in Table 4.3.4.2 can be achieved. As discussed in the following Technical Feasibility section, the use of dust suppressants was found to be technically infeasible; therefore, they are not included in this table.

**Table 4.3.4.2 Emissions Reductions for Non-Metallic Mineral Processing Control Measures**

| Emission Point/ Control Measure | $PM_{10}$ Emissions Controllable lb/hr (tons) | $PM_{10}$ Emissions Eliminated lb/yr (tons/yr) | Percent Reduction in Total Industry Emissions | Percent Reduction in Industry Category Emissions |
|---|---|---|---|---|
| Work Practice Standards | 10897.3 (5.4) | 8960 (4.5) | 1.3% | 2.3% |
| Partial Enclosure | 10897.3 (5.4) | 9444 (4.7) | 1.4% | 2.5% |
| Complete Enclosure | 10897.3 (5.4) | 9929 (5.0) | 1.5% | 2.6% |
| Baghouse for Bin/Silo Vents | 47648 (23.8) | 40,658(20.3) | 6.1% | 10.7% |
| Baghouse/Suction Shroud and Bin/Silo Vents | 55467 (29.3) | 51,071 (25.5) | 7.7% | 13.4% |

For instance, by implementing the requirement for all bin vents or silo vents to be equipped with a baghouse, $PM_{10}$ emissions from point sources without a stack would be reduced by 20.3 tons or 10.7%.

*Rule Compliance/Test Methods/Recordkeeping*

***Rule Compliance:***

- Require all aggregate material to be washed prior to delivery.
- Install a warning device on each bulk storage silo. This device shall alert operators in sufficient time prior to the silo reaching capacity during loading operations so that the loading operation can be stopped prior to filling to such a level as to potentially adversely impact the pollution abatement equipment.
- Spillage of materials used in the batch shall be immediately cleaned up and contained or dampened so that dust emissions are minimized.

***Test Methods:***

- All filter systems, mixer loading, and batch truck loading emissions control devices shall meet a performance standard of no visible emissions exceeding 30 seconds in any six-minute period as determined using U.S. Environmental Protection Agency (EPA) Test Method 22; No visible fugitive dust emissions beyond the permittee's property line.

*Technical Feasibility*

Partial or full enclosures and hoods, such as suction shrouds, are widely used methods to capture and control particulate matter emissions from non-metallic mineral processing facilities. For instance, a suction shroud and baghouse achieving 95% control efficiency is required in many

jurisdictions, such as the TCEQ and the Utah Division of Air Quality.

A suction shroud and baghouse combination can control particulate matter emissions from conveyors, drop points, crushing and screening and many more processes with an overall control efficiency of 95 to 99%. The suction shroud and baghouse combination consists of a ventilation system or a large canopy-type hood suspended over a localized source of $PM_{10}$. Emissions are forced through a baghouse resulting in 95-99% capture. The ventilation system must be uniquely designed to conform to the facility configuration. In addition, the ventilation system must allow for process access, which could impact the ventilation system's performance and decrease productivity of the production line. In some facilities, ventilation hooding and its ductwork may be difficult to retrofit due to space limitations or the fact that the facility is portable. Ventilation systems are designed to meet the criteria in EPA Contract #68-D-98-026 titled, *Stationary Source Control Techniques Document for Fine Particulate Matter,* October 1998. The hood needs to encompass, as much as possible, the source of particulate matter emissions without excessively interfering with the access needed for normal operations. The hood should be designed and installed in a manner that emissions are directed into the hood through either natural buoyancy or mechanical forces rather than away from the hood. The ventilation system must be designed to operate within required parameters, such as recommended face velocities, which typically range between 75 to 150 meters per minute. In summary, a ventilation system may be feasibly implemented for most operations through careful design and planning; however some operations may require severe retrofitting, which precludes its use.

Currently, numerous BACT analyses have been conducted on different non-metallic mineral processes. These are listed in EPA's RACT/BACT/LAER Clearinghouse (RBLC) database, California ARB BACT Clearinghouse, San Diego County's Air Pollution Control District (APCD) BACT Guidelines, and San Joaquin Valley's APCD BACT Guidelines. Within these BACT guidelines, baghouses have been installed on concrete batch facilities, conveyor points, silo/bin vents, crushing and screening operations, and many additional similar activities. Dust suppressants and partial and full enclosures have been utilized to control emissions from conveyors and crushing and screening operations. The proposed methods for controlling $PM_{10}$ emissions from non-metallic mineral processing described herein have been documented by others, achieved in practice, and are technically feasible.

Dust suppressants are feasible on limited processes in industry, but are not as popular or used with the same frequency as enclosures or baghouses. The use of dust suppressants is limited because of compatibility issues with raw materials and the potential of contaminating the final product. Industrial processes using heat may increase emissions from dust suppressants or produce unwanted byproducts. For these reasons, dust suppressants are not technically feasible for controlling particulate matter emissions from emissions points such as conveyors, crushers, screening operations and drop points.

To summarize, the control measures of dust suppressants, partial enclosures, full enclosures and baghouses, described above, are successfully used in practice and are required by other air quality districts. Dust suppressants, however, are not technically feasible for use by industries in the Salt River area because of operational limitations. No technical limitations are experienced for implementing baghouses, suction shrouds, partial enclosures and full enclosures.

*Economic Feasibility*

Retrofitting existing plants with updated controls can be resource intensive. Suction shrouds can cost $40,000 and suction shroud/baghouse systems range from $25,000 to $50,000.

*Auxiliary Advantages/Disadvantages*

***Advantages.*** A baghouse filtration system is easily maintained and achieves highly effective emissions control. Enclosures, both full and partial, exhibit a high level of capture and control, have a one-time installation cost, minimal maintenance and operating costs, and have no energy costs. Dust suppressants are easy to use and have crossover benefits with stockpiles and materials handling.

***Disadvantages.*** A baghouse filtration system is difficult to retrofit in some facilities due to space limitations and in portable sources, has energy costs. Local ventilation systems may limit personnel and equipment access. Enclosures, both full and partial, limit equipment access and sometimes pose retrofit issues, especially for portable sources. Dust suppressants have a number of potential disadvantages: incompatibility issues with final product, negative environmental impacts, material and operations costs, operator error when applying the suppressant, frequent application requirements, and potentially increased inspections.

*Cost-Effectiveness*

The cost-effectiveness of various potential control measures is presented below:

***Baghouse Only.*** A cost analysis was performed on one baghouse that was assumed to be 5,000 actual cubic feet per minute of air intake. The baghouse would be installed on bin/silo vents to achieve a 10.7% reduction in overall total point source non-stack emissions or a reduction of 20.3 tons. The cost of the equipment and annual operating costs for "one" baghouse are summarized below:

Total capital investment = $23,782
Annual operation costs = $69,538

The cost-effectiveness of requiring baghouses to be installed on silo and bin vents is summarized in Tables 4.3.4.3. and 4.3.4.4. It should be noted that the cost is based on one control device per all controllable emissions.

**Table 4.3.4.3: Cost-Effectiveness as a function of Capital Cost per Baghouse System**

| Unit | Cost |
|---|---|
| $ per % reduction in total non-point source emissions | $2,223 |
| $ per ton of $PM_{10}$ emissions eliminated | $1,172 |
| $ per % change in $PM_{10}$ emissions controllable and eliminated | $280 |

**Table 4.3.4.4: Cost-Effectiveness as a function of Annual Operating Cost per Baghouse System**

| Unit | Cost |
|---|---|
| $ per % reduction in total non-point source emissions | $6,499 |
| $ per ton of $PM_{10}$ emissions eliminated | $3,426 |
| $ per % change in $PM_{10}$ emissions controllable and eliminated | $818 |

***Baghouse with Suction Shroud.*** A cost analysis was performed on one baghouse with suction shroud. The baghouse is assumed to be 5000 actual cubic feet per minute of air intake and the suction shroud is assumed to have a face area of 36 $ft^2$. The baghouse and suction shroud would be installed on bin/silo vents conveyors, crushers and drop points to

achieve a 13.4% reduction in overall total point source non-stack emissions or a reduction of 25.5 tons. The cost of the equipment and annual operating costs for "one" baghouse and one suction shroud are summarized below:

Total capital investment = $30,243
Annual operating costs = $89,566

In addition, the Air Quality Standard Permit for Concrete Batch Plants from the TCEQ shows that to retrofit plants with a baghouse and suction shroud would cost $40,000 as seen on page 29 of the Permit, or $25,000 to $50,000 as seen on page 30.

Using the calculated total capital investment and annual operating costs, the cost-effectiveness of requiring baghouses and suction shrouds to be installed on silo and bin vents, conveyors, crushers, and drop points is summarized in Tables 4.3.4.5 and 4.3.4.6 (it should be noted that the cost is based on one control device per all controllable emissions):

**Table 4.3.4.5: Cost-Effectiveness as a function of Capital Cost for One Baghouse & Suction Shroud System**

| Unit | Cost |
|---|---|
| $ per % reduction in total non-point source emissions | $2,257 |
| $ per ton of $PM_{10}$ emissions eliminated | $1,186 |
| $ per % change in $PM_{10}$ emissions controllable and eliminated | $348 |

**Table 4.3.4.6: Cost-Effectiveness as a function of Annual Operating Cost for One Baghouse & Suction Shroud System**

| Unit | Cost |
|---|---|
| $ per % reduction in total non-point source emissions | $6,684 |
| $ per ton of $PM_{10}$ emissions eliminated | $3,512 |
| $ per % change in $PM_{10}$ emissions controllable and eliminated | $1,029 |

***Dust suppressants.*** Dust suppressants are determined to be not technically feasible; therefore, a cost-effectiveness evaluation was not conducted.

*BACM and MSM Analysis*

Tables 4.3.4.7 – 4.3.4.9 outline current control measures, benchmarked control measures, and additional recommended control measures for crushing and screening plants, concrete batch plants, and hot mix asphalt plants. Currently, MCESD Rule 316 regulates this source category. MCESD Rule 316 is modeled after the New Source Performance Standard (NSPS), 40 CFR 60 Subpart OOO entitled "Standards of Performance for Nonmetallic Mineral Processing Plants." The recommended changes are additional control measures that are proposed as MSM for MCESD Rule 316. Augmentation of Rule 316 to include the portions of Rule 310 that are relevant to non-metallic mineral product processing is a selected control measure in addition to the measures shown in the table.

The following table outlines current control measures, benchmarked controls, and recommended augmentations to Rule 316 for non-metallic mineral mining and processing. Currently Maricopa County Rule 316 regulates this source category. Maricopa County Rule 316 is modeled after the New Source Performance Standard (NSPS), 40 CFR 60 Subpart OOO titled, "Standards of Performance for Nonmetallic Mineral Processing Plants." The recommended changes are additional control measures that are proposed as MSM for Maricopa County Rule 316.

**Table 4.3.4.7 Maricopa County Rule 316: CRUSHING AND SCREENING PLANTS**

| Current Rule 316 Controls | Benchmarked Controls | Recommended Augmentations to Rule 316 |
|---|---|---|
| Stack emissions from Crushing and Screening Plants are limited to 7% opacity or containing no more than 0.02 grains per dry standard cubic foot of particulate matter | None | Require all stack emissions to be vented to a baghouse, and retain the existing language. |
| Fugitive dust emissions from Crushing and Screening Plants are limited to 7% opacity from any transfer point on a conveyor system. | TCEQ, TAC §111.143 Materials Handling: Installation, maintenance and proper use of hoods, fans and filter to enclose, collect and clean the emissions of dusty materials.<br><br>Florida, FAC 62-296.711 Materials Handling, Sizing, Screening Crushing and Grinding Operations: if it is necessary to totally or partially enclose an operation and exhaust particulate laden gases through a vent or stack, emissions of particulate from such vent or stack shall not exceed 0.03 gr/dscf<br><br>SCAQMD, BACT Guidelines for Non-Major Polluting Facilities: Enclosed conveyors and baghouse<br><br>TCEQ, Permit by Rule §106.144, Bulk Mineral Handling: All material shall be transported in a closed conveying system and all exhaust air to the atmosphere shall be vented through a fabric filter having a maximum filtering velocity of 4.0 feet per minute with mechanical cleaning or 7.0 feet per minute with automatic air cleaning. | No change |
| Fugitive dust emissions from Crushing and Screening Plants are limited to 15% opacity from any crusher. | None | No change |
| Fugitive dust emissions from Crushing and Screening Plants are limited to 10% opacity from any affected operation or process source excluding truck dumping directly into any screening operation, feed hopper or crusher. | None | No change |

| Table 4.3.4.7 Maricopa County Rule 316: CRUSHING AND SCREENING PLANTS | | |
|---|---|---|
| **Current Rule 316 Controls** | **Benchmarked Controls** | **Recommended Augmentations to Rule 316** |
| Fugitive dust emissions from Crushing and Screening Plants are limited to 20% opacity from any other affected operation. | None | No change |
| ---- | Permanently Mounted Watering Systems:<br>The owner or operator shall install, maintain, and operate permanently mounted watering systems (such as spay bars, or an equivalent control) at all of the following locations:<br>• Inlet and outlet of all crushers;<br>• Inlet and outlet of all screens; and<br>• Material transfer points. | The owner or operator shall install, maintain and operate permanently mounted watering systems (such as spray bars, or an equivalent control) at all of the following locations:<br>• Inlet and outlet of all crushers;<br>• Outlet of all screens; and<br>• Material transfer points. |
| ---- | Work Practice Standards<br>• All screen sides are required to be enclosed with at least an 85% mesh fabric filter..<br>• The outlet of all screens shall be enclosed or controlled through the application of a watering system, such as, but not limited to, spray bars or foggers. | • All screen sides are required to be enclosed with at least an 85% mesh fabric filter..<br>•<br>• The outlet of all screens shall be enclosed or controlled through the application of a watering system, such as, but not limited to, spray bars or foggers. |
| ---- | Visible Emissions Standard<br>No visible fugitive emissions shall leave the property from the crusher, associated sources, and in-plant roads associated only with the facility. | No visible fugitive emissions shall leave the property from the crusher, associated sources, and in-plant roads associated only with the facility. |
| ---- | Method 9 Observer<br>Require an EPA Method 9 observer to be on-site or on-call at all times. | Require an EPA Reference Method 9 observer to be on-site or on-call at all times. |

The following table outlines current control measures, benchmarked controls, and recommended augmentations to Rule 316 for concrete batch plants. Currently, Maricopa County Rule 316 regulates this source category. The recommended changes are additional control measures that are proposed as MSM for Maricopa County Rule 316.

**Table 4.3.4.8 Maricopa County Rule 316: CONCRETE BATCH PLANTS**

| Current Rule 316 Controls | Benchmarked Controls | Recommended Augmentations to Rule 316 |
|---|---|---|
| Stack emissions from Concrete Batch Plants are limited to 7% opacity | TCEQ, Concrete Batch Plant Technical Guidance for Mechanical Sources, January 2001, Draft:<br>• All dry material storage silos equipped with fabric filter baghouse having a maximum outlet grain loading of 0.01 grains per dry standard cubic foot<br>• All storage silos must be equipped with audible or visual warning devices to prevent overloading. | In addition to the existing opacity requirement, require all cement and fly-ash silos to be equipped with baghouse or equivalent control device. All new control devices shall be designed to meet an emission limitation of 0.01 grains per dry standard cubic foot.<br><br>All storage silos must be equipped with audible or visual warning devices to prevent overloading. |
| Fugitive dust emissions from Concrete Batch Plants are limited to 10% opacity from any affected operation or process source, excluding truck dumping directly into any screening operation, feed hopper or crusher | TCEQ, Air Quality Standard Permit for Concrete Batch Plants, Effective Date July 10, 2003: Dust emissions at the batch mixer feed shall be controlled by one of the following:<br>• A spray device which eliminates visible emissions<br>• A pickup device delivering air to a fabric or cartridge filter<br>• An enclosed batch mixer feed such that no visible emissions occur<br>• Conducting the entire mixing operation inside the enclosed process building such that no visible emissions from the building occur during mixing activities | In addition to the existing opacity requirement, dust emissions at the batch mixer feed shall be controlled by one of the following:<br>• A spray device which eliminated visible emissions;<br>• A pickup device delivering air to a fabric or cartridge filter;<br>• An enclosed batch mixer feed such that no visible emissions occur; or<br>• Conducting the entire mixing operation inside the enclosed process building such that no visible emissions from the building occur during mixing activities. |
| Fugitive dust emissions from Concrete Batch Plants are limited to 20% opacity from truck dumping directly into any screening operation feed hopper or crusher. | TCEQ, Air Quality Standard Permit for Concrete Batch Plants, Effective Date July 10, 2003: A suction shroud or other pickup device shall be installed at the batch drop point and vented to a fabric or cartridge filter system with a minimum of 4,000 actual cubic feet per minute of air.<br><br>SCAQMD, BACT Guidelines for non-major polluting | No change |

| Table 4.3.4.8 Maricopa County Rule 316: CONCRETE BATCH PLANTS | | |
|---|---|---|
| **Current Rule 316 Controls** | **Benchmarked Controls** | **Recommended Augmentations to Rule 316** |
| | facilities:<br>Central mixed <5 cubic yards/batch – water spray<br>Central mixed >5 cubic yards/batch – baghouse for cement handling and adequate moisture in aggregate<br>Transit-mixed—baghouse venting the cement weight hopper and the mixer truck loading station and adequate aggregate moisture | |
| ---- | <u>Visible Emissions Standard for Cement Silos</u><br>• All cement silo loading operations shall be controlled by a pressure control system that discontinues the loading process if excessive pressure is being used to load the cement silo. | All cement silo loading operations shall be controlled by a pressure control system that discontinues the loading process if excessive pressure is being used to load the cement silo. |
| ---- | <u>Work Practice Standards</u><br>• Spillage of materials used in the batch shall be immediately cleaned up and contained or dampened so that dust emissions are minimized.<br>• Dust emissions at the batch mixer feed shall be controlled by one of the following:<br>(i) A spray device;<br>(ii) A pickup device delivering air to a fabric or cartridge filter;<br>(iii) An enclosed batch mixer feed such that no visible emissions occur; or<br>(iv) Conducting the entire mixing operation inside the enclosed process building such that no visible emissions from the building occur during mixing activities. | • Spillage of materials used in the batch shall be immediately cleaned up and contained or dampened so that dust emissions are minimized.<br>• Dust emissions at the batch mixer feed shall be controlled by one of the following:<br>(i) A spray device;<br>(ii) A pickup device delivering air to a fabric or cartridge filter;<br>(iii) An enclosed batch mixer feed such that no visible emissions occur; or<br>(iv) Conducting the entire mixing operation inside the enclosed process building such that no visible emissions from the building occur during mixing activities. |
| ---- | <u>Method 9 Observer</u><br>Require an EPA Method 9 observer to be on-site or on-call at all times. | Require an EPA Reference Method 9 observer to be on-site or on-call at all times. |

The following table outlines current control measures benchmarked controls, and recommended augmentations to Rule 316 for hot mix asphalt plants and material handling. Currently Maricopa County Rule 316 regulates this source category. Maricopa County Rule 316 is modeled after the New Source Performance Standard (NSPS), 40 CFR 60 Subpart I entitled "Standards of Performance for Hot Mix Asphalt Facilities." The recommended changes are additional control measures that are proposed as MSM for Maricopa County Rule 316.

**Table 4.3.4.9 Maricopa County Rule 316: ASPHALT BATCH PLANTS**

| Current Rule 316 Controls | Benchmarked Controls | Recommended Augmentations to Rule 316 |
|---|---|---|
| Stack emissions from Hot Mix Asphalt Plants are limited to 20% opacity and containing no more than 0.04 grains per dry standard cubic foot of particulate matter | TCEQ, Air Quality Standard Permit for Hot Mix Asphalt Plants, Effective Date July 10, 2003:<br>• The drum dryer exhaust shall be vented to and controlled by a properly sized fabric filter baghouse<br>• Silos not vented to the drum dryer system shall vent to a fabric filter system designed to meet at least 0.01 outlet grain loading | • Require all drum dryers to be equipped with baghouse<br>• Require all cement and lime storage silos to be equipped with a baghouse. All new baghouses shall be designed to meet an emission limitation of 0.01 grains per dry standard cubic foot. |
| Fugitive dust emissions from Hot Mix Asphalt Plants are limited to 20% opacity from any other affected operation or process source. | Visible Emissions Standards<br><br>A baghouse is required on the drum dryer and cement and lime storage silos with an opacity limit of not greater than 5% over a six-minute period. | A baghouse is required on the drum dryer and cement and lime silos with an opacity limit of not greater than 5% over a six-minute period. |
| ---- | Overfill Warning System<br><br>An audible or visible overflow warning device shall be installed on each bulk storage silo to alert operators in sufficient time prior to the silo reaching capacity. | An audible or visible overflow warning device shall be installed on each bulk storage silo to alert operators in sufficient time prior to the silo reaching capacity. |
| ---- | Method 9 Observer<br>Require an EPA Method 9 observer to be on-site or on-call at all times. | Require an EPA Reference Method 9 observer to be on-site or on-call at all times. |

*BACM and MSM Not Proposed for Consideration*

Of the BACM and MSM measures that have been benchmarked, these additional measures have been considered, but are not recommended for inclusion in Rule 316 as they are either duplicative of other measures that are being proposed for adoption into Rule 316, or they are as stringent, or less stringent than other measures that have been proposed for adoption into Rule 316. In addition, because the permitting authorities in the State of Arizona do not write general permits into rule like permitting authorities in Texas, requirements restricting co-location (including ground-based concentration limitations) are not recommended because such scenarios are already accounted for in Arizona general permits, and must remain an option for sources seeking individual permits. Finally, nighttime illumination was rejected because of the history of complaints from nearby residents regarding excessive lighting from these types of facilities.

***Crushing And Screening Plants***

*Visible Emissions Standard.*

*Clark County, Nevada; AQR Section 34 New Performance Standards for Nonmetallic Mineral Mining and Processing*

*Oklahoma DEQ, General Permit for Minor Source Nonmetallic Mineral Processing*

*TCEQ, Air Quality Standard Permit for Temporary Rock Crushers, February 2002*

*Enclosures for Long-Term Facilities.*

*Bay Area Air Quality Management District BACT Guideline for rock and aggregate processing*

*Work Practice Standards.*

*TCEQ, February 2002, Standard Permit for Rock Crushing Plants, BACT Analysis*

*Oklahoma DEQ, General Permit for Minor Source Nonmetallic Mineral Processing*

*Oklahoma DEQ, General Permit for Minor Source Nonmetallic Mineral Processing*

*Oklahoma DEQ, General Permit for Minor Source Nonmetallic Mineral Processing*

*Air Dispersion Analysis Based Rules.*

*TCEQ Rule §111.155. Ground Level Concentrations, Adopted June 16, 1989*

*TCEQ, Air Quality Standard Permit for Temporary Rock Crushers, February 2002*

***Concrete Batch Plants***

*Cement Silo Baghouse, Fabric Filter or Cartridge Filter Requirement.*

*TCEQ; Concrete Batch Plant Technical Guidance for Mechanical Sources, January 2001, Draft BACT Analysis*

*Work Practice Standards.*

*Texas Requirements from Technical Guidance: TCEQ; Concrete Batch Plant Technical Guidance for Mechanical Sources, January 2001, Draft BACT Analysis*

*Texas Requirements from Standard Permit for Concrete Batch Plants: TCEQ; Effective Date July 10, 2003*

*Bay Area Air Quality Management District Requirements: BACT Guideline for Concrete Batch*

*SCAQMD Requirements: BACT Guidelines for Non-Major Polluting Facilities; Concrete Batch Plant*

*Florida Requirements: Florida; Florida Administrative Code 62-296.414 Concrete Batching Plants*

*Production Limitations.*

*SCAQMD; BACT Guidelines for non-major polluting facilities Concrete batch plant*

*Visible Emissions Standard.*

*Florida; Florida Administrative Code 62-296.414 Concrete Batching Plants*

***Asphalt Batch Plants***

*Emissions Limitations and Standards.*

*Florida FAC 62-296.704 Asphalt Concrete Plants*

*Air Dispersion Analysis Based Rules.*

*TCEQ Air Quality Standard Permit For Hot Mix Asphalt Plants Effective Date July 10, 2003*

***Windblown Cleared Areas – Industrial***

*Background*

Cleared areas with disturbed soils from industrial activities such as earthmoving are subject to the erosive effects of wind. As trucks and other vehicles move about a cleared site, soils become unstable, and winds above 15 mph can result in significant $PM_{10}$ emissions.

*Potential Control Measures*

If an industrial facility does not have an earthmoving permit, the potential control measure for the areas subject to wind erosion is augmentation and better enforcement of MCESD Rule 316 for

industrial sources. Currently, MCESD Rule 310 regulates all dust-generating operations; however, the following recommended change is an additional control measure that is proposed as MSM for MCESD Rule 316:

> Stabilize surface soils where loaders, support equipment, and vehicles will operate by pre-watering and maintaining surface soils in a stabilized condition, or by applying and maintaining a dust palliative on surface soils.

Because Rule 310 already applies to emissions from this source category, the intent is only to augment and supplement those controls that already exist. All portions of 310 that are currently applicable to this source category will remain applicable to this source category unless a more stringent measure is identified.

If an industrial facility has an earthmoving permit, the potential control measure for the areas subject to wind erosion is better enforcement of MCESD Rule 310 pertaining to the control of fugitive dust. A critical aspect of strengthening enforcement of the Rule 310 control measures is the hiring of as many as 25 to 30 additional inspectors for the entire program (this includes resources for the enforcement of Rule 316 pertaining to industrial sources).

The methods available under Rule 310 to control windblown dust emissions from disturbed areas include opacity restrictions, the use of water or dust suppressants, and the installation of wind barriers. Temporary measures to be implemented during weekends, after work hours, on holidays or high wind events include applying water, dust suppressants, or gravel, and restricting vehicular access.

***Stockpiles***

*Background*

As part of operations that use minerals in aggregate form is the control of outdoor aggregate handling and stockpiles. Aggregate handling and stockpiles are often left uncovered, partially because of the need for frequent material transfer into or out of storage. As a result, these aggregate handling and stockpiles are a significant source of particulate matter emissions. As front loaders and trucks add and remove materials from these points, a significant amount of particulate matter emissions are generated.

As seen in Section 13.2.4, titled “Aggregate Handling and Stockpiles” within the Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: *Miscellaneous Sources* by the Environmental Protection Agency, the amount of particulate emissions from aggregate handling and stockpiles varies with the amount of aggregate passing through the storage cycle. Additionally there are 3 parameters which effect emissions: moisture content, age of the pile, and proportion of aggregate fines.

*Sources Controlled*

Many sources contribute to particulate matter emissions from aggregate handling and stockpiles. Some industrial sources that deal with aggregate handling and stockpiles are the concrete batch plant and crushing and screening sources. Both sources use stockpiles and material handling in the same fashion. Aggregate is delivered on site and dumped in piles. Aggregate is then removed from the piles using front end loaders which deliver the material to conveyers, elevated storage bins, and/or feed hoppers.

*Description of Emissions*

Particulate matter emissions from aggregate handling and stockpiles are generated from a variety of conditions. When newly processed aggregate is loaded onto a stockpile, the potential for particulate matter emissions is at a maximum. Fines are easily agitated and released to the atmosphere upon exposure to air currents, either from disturbance of the pile by dumping or removal by front end loader, or from high winds.

*Potential Control Measures*

There are three main control measures available for reducing particulate matter emissions from aggregate handling and stockpiles: watering, chemical wetting agents, and partial or full enclosures. The following are potential control measures for reducing particulate matter emissions from aggregate handling and stockpiles.

***Chemical Additives.*** Chemical additives may be either wet or dry and can be added to the pile. The benefit to chemical additives is that it lasts longer with only one application. However, depending on the types of chemicals used it could be hazardous.

***Water.*** Water is the most common method employed for controlling emissions from stockpiles and aggregate handling. Water is especially useful in areas near the stockpile where vehicle traffic is the greatest.

***Partial or Full Enclosures.*** Enclosures can be used to prevent wind erosion of stockpiles and aggregate handling areas.

*Emission Reductions*

With the implementation of the potential control measures listed above in Section 2, the following estimated emission reductions can be expected:

***Chemical Additives.*** Chemical additives have a net decrease of emissions equal to 68% for stockpiles. For aggregate handling the net decrease of emissions is equal to 7%.

***Partial Enclosures.*** Partial enclosures have a net decrease of emissions equal to 76% for stockpiles. For aggregate handling the net decrease of emissions is equal to 11%.

***Full Enclosures.*** Full enclosures have a net decrease of emissions equal to 88% for stockpiles. For aggregate handling the net decrease of emissions is equal to 15%.

*BACM/MSM Analysis*

Table 4.3.4.10 outlines current control measures, benchmarked control measures, and additional recommended control measures for stockpiles. Currently, MCESD Rule 310 regulates stockpiles at industrial sources and construction sources. The recommended changes are additional control measures that are proposed as MSM for MCESD Rule 316. Because Rule 310 already applies to emissions from this source category, the intent is only to augment and supplement those controls that already exist. All portions of Rule 310 that are currently applicable to this source category will remain applicable to this source category unless a more stringent measure is identified.

The following table outlines current control measures, benchmarked control measures, and additional recommended control measures for stockpiles. Currently, Maricopa County Rule 310 regulates stockpiles at industrial and construction sources; however these recommended changes are additional control measures that are proposed as MSM for Maricopa County Rule 316. Because Rule 310 already applies to emissions from this source category, the intent is only to augment and supplement those controls that already exist. All portions of 310 that are currently applicable to this source category will remain applicable to this source category unless a more stringent measure has been identified.

**Table 4.3.4.10 Maricopa County Rule 310: STOCKPILES**

| Current Rule 310 Controls | Benchmarked Controls | Recommended Augmentations to Rule 316 |
|---|---|---|
| An open stockpile is any accumulation of bulk material with a 5% or greater silt content, which in any one point attains a height of three feet and covers a total surface area of 150 square feet or more. Silt content shall be assumed to be 5% or greater unless a person can show, by testing in accordance with ASTM Method C136-01 or an equivalent method approved in writing by the Control Officer, Director and the Administrator of the EPA, that the silt content is less than 5%. | None | An open stockpile is any accumulation of bulk material with a 5% or greater silt content, which in any one point attains a height of three feet and covers a total surface area of 150 square feet or more. Silt content shall be assumed to be 5% or greater unless a person can show, by testing in accordance with ASTM Method C136-01 or an equivalent method approved in writing by the Control Officer, Director and the Administrator of the EPA, that the silt content is less than 5%. |
| Prior to and while conducting stacking, loading, and unloading operations, comply with one of the following work practices;<br>• Spray material with water as necessary<br>• Spray material with dust suppressant other than water as necessary | None | Prior to and while conducting stacking, loading, and unloading operations, comply with one of the following work practices;<br>• Spray material with water as necessary<br>• Spray material with dust suppressant other than water as necessary |
| When not conducting stacking, loading, and unloading operations, comply with one of the following work practices: | None | When not conducting stacking, loading, and unloading operations, comply with one of the following work practices: |
| • Cover open stockpiles with tarps, plastic, or other material to prevent wind from removing the coverings;<br>• Apply water to maintain soil moisture content at a minimum of 12%, as determined by ASTM Method D2216-98, or an equivalent method as approved by the Control Officer, Director and the Administrator of the EPA. For areas which have an optimum moisture content for compaction of | TCEQ – Requirements for Concrete Batch Plant<br>• Stockpiles located no less than 25 or 50 feet from property line for a production rate of less than 200 or between 200 and 300, respectively.<br><br>TCEQ – Requirements for Temporary rock crushers<br>• Raw material and product stockpiles | • Cover open stockpiles with tarps, plastic, or other material to prevent wind from removing the coverings;<br>• Apply water to maintain soil moisture content at a minimum of 12%, as determined by ASTM Method D2216-98, or an equivalent method as approved by the Control Officer, Director and the Administrator of the EPA. For areas which have an optimum moisture content for compaction of |

| Table 4.3.4.10 Maricopa County Rule 310: STOCKPILES | | |
|---|---|---|
| **Current Rule 310 Controls** | **Benchmarked Controls** | **Recommended Augmentations to Rule 316** |
| less than 12%, as determined by ASTM Method D1557-91(1998) or an equivalent method approved by the Control Officer, Director and the Administrator of the EPA, maintain at least 70% of the optimum soil moisture content;<br>• Meet one of the following stabilization requirements; or<br>o Maintain a visible crust<br>o Maintain a threshold friction velocity for disturbed surface areas corrected for non-erodible elements of 100 cm/seconds or higher;<br>o Maintain a flat vegetative cover that is equal to at least 50%;<br>o Maintain a standing vegetative cover that is equal to or greater than 30%;<br>o Maintain a standing vegetative cover that is equal to or greater than 10% and where the threshold friction velocity is equal to or greater than 43 cm/second when corrected for non-erodible elements;<br>o Maintain a percent cover that is equal to or greater than 10% for non-erodible elements; or<br>o Comply with a standard of an alternative test method, upon obtaining the written approval from the control officer and the administrator of the Environmental Protection Agency (EPA).<br>• Construct and maintain wind barriers, storage silos, or a three-sided enclosure with walls, whose length is no less than equal to the length of the pile, whose distance from the pile is no more than twice the height of the pile, whose height is equal to the pile height, and whose porosity is no more than 50%. If implementing this condition, the silt loading standards or stabilizations requirements must also be met. | heights shall not exceed 45 feet<br><br>Clark County Nevada §94.11.3 and § 41.1.1.2<br>• Stockpile located within 100 yards of occupied building shall not be constructed over eight feet in height | less than 12%, as determined by ASTM Method D1557-91(1998) or an equivalent method approved by the Control Officer, Director and the Administrator of the EPA, maintain at least 70% of the optimum soil moisture content;<br>• Meet one of the following stabilization requirements:<br>o Maintain a visible crust<br>o Maintain a threshold friction velocity for disturbed surface areas corrected for non-erodible elements of 100 cm/seconds or higher;<br>o Maintain a flat vegetative cover that is equal to at least 50%;<br>o Maintain a standing vegetative cover that is equal to or greater than 30%;<br>o Maintain a standing vegetative cover that is equal to or greater than 10% and where the threshold friction velocity is equal to or greater than 43 cm/second when corrected for non-erodible elements;<br>o Maintain a percent cover that is equal to or greater than 10% for non-erodible elements; or<br>o Comply with a standard of an alternative test method, upon obtaining the written approval from the control officer and the administrator of the environmental protection agency (EPA).<br>• Construct and maintain wind barriers, storage silos, or a three-sided enclosure with walls, whose length is no less than equal to the length of the pile, whose distance from the pile is no more than twice the height of the pile, whose height is equal to the pile height, and whose porosity is no more than 50%. If implementing this condition, the silt loading standards or stabilizations requirements must also be met. |

| Table 4.3.4.10 Maricopa County Rule 310: STOCKPILES | | |
|---|---|---|
| **Current Rule 310 Controls** | **Benchmarked Controls** | **Recommended Augmentations to Rule 316** |
| | | • Raw material and product stockpiles at new facilities shall be located at least 25 feet from the property line. New stockpiles at existing facilities are limited to this setback if determined to be feasible on a case-by-case basis through the Dust Control Plan by assessing the amount of open land available at the property before the new stockpiles are formed.<br><br>• Raw material and product stockpile heights shall not exceed 45 feet. |
| ---- | No visible emissions beyond property line: A person shall not cause or allow the emissions of fugitive dust from any active operation, open stockpile, or disturbed surface area such that the presence of such dist remains visible in the atmosphere beyond the property line of the emission source. Exemption for wind gusts exceeding 25 mph, if high wind control measures are implemented. Pima County Code §17.16.050.D | No visible emissions beyond property line: A person shall not cause or allow the emissions of fugitive dust from any active operation, open stockpile, or disturbed surface area such that the presence of such dist remains visible in the atmosphere beyond the property line of the emission source. Exemption for wind gusts exceeding 25 mph, if high wind control measures are implemented, and for activities unrelated to the permitted facility. |
| ---- | Stabilize surface soils where support equipment and vehicles will operate by pre-watering and maintaining surface soils in a stabilized condition; or by applying and maintaining a dust palliative on surface soils. Pima County Code §17.16.050.D | Stabilize surface soils where support equipment and vehicles will operate by pre-watering and maintaining surface soils in a stabilized condition; or by applying and maintaining a dust palliative on surface soils. |

*Additional BACM And MSM Not Recommended for Consideration*

Of the BACM and MSM measures that have been benchmarked, these additional measures have been considered but are not recommended for inclusion in Rule 316 as they are either duplicative of other measures that are being proposed for adoption into Rule 316, or they are as stringent, or less stringent than other measures that have been proposed for adoption into Rule 316.

**Active Stockpile Activities.**

*Clark County Construction Activities Dust Control handbook – Stockpiling*

**Other Stockpile Activities.**

*Modeled Concentration Based Rules. TCEQ, Rule § 111.155 Ground Level Concentrations.:*

*Stockpile Height Limitations. TCEQ - Air Quality Standard Permit for Hot Mix Asphalt Plants Effective Date July 10, 2003:*

***Unpaved Haul and Access Roads***

*Background*

Vehicular travel on and windblown emissions from unpaved roads and unpaved parking lots generate significant amounts of fugitive dust and can also lead to trackout of particulate matter onto existing paved roads. These emissions are a result of dust being reentrained into the atmosphere. The sources affected are any non-metallic mineral products processing facility which has unpaved haul and access roads, which includes vehicle traffic on dirt or gravel roads at industrial sites that consists of quarry pit roads, entrance and exit roads, and transfer roads.

*Potential Control Measures*

The following measures for the control of fugitive dust emissions from unpaved roads were evaluated: dust suppressants, paving, sweeping, watering, wet sweeping, and foaming.

*Emission Reductions*

The 1997 SCAQMD staff report for Rule 1186 (applicable to unpaved roads within the South Coast Air Basin) includes the following emission reduction percentages for various control options: 94% reduction for paving, 75% reduction for applying chemical stabilizers, and 50% reduction for a 15 mph speed limit.

Based upon the Texas Commission for Environmental Quality (TCEQ) general permit application for concrete batch plants, the emissions reduction percentages shown in Table 4.3.4.11 can be achieved for the following controls: 80% reduction for oiling unpaved roads, 85% reduction for application of chemical foam, 90% reduction for paving and sweeping, 95% reduction for paving and watering, 98% reduction for paving and wet sweeping, and 99% reduction for paving and foam application.

**TABLE 4.3.4.11 Emissions Reductions Percentages for Unpaved Haul and Access Roads Control Measures**

| Emission Point/ Control Measure | $PM_{10}$ Emissions Controllable lb/yr (tons) | $PM_{10}$ Emissions Eliminated lb/yr (tons/yr) | Percent Reduction in Total Industry Emissions | Percent Reduction in Industry Category Emissions |
|---|---|---|---|---|
| Dust Suppressants (85% Control) | 381,706 (190.9) | 105,160(52.6) | 15.8% | 27.5% |
| Pave 50% of all unpaved roads at facilities with pits, and 65% of all unpaved roads at facilities without pits. All remaining unpaved roads would be watered (assumed 70% control), and the following maintenance will be applied to the newly paved roads. | | | | |
| Sweeping (90% control) | 381,706 (190.9) | 80,219 (40.1) | 12.1% | 21.0% |
| Watering (95% control) | 381,706 (190.9) | 98,672 (49.3) | 14.8% | 25.9% |
| Wet Sweeping (98% control) | 381,706 (190.9) | 109,743 (54.9) | 16.5% | 28.8% |
| Foaming (99% control) | 381,706 (190.9) | 113,434 (56.7) | 17.1% | 29.7% |
| Pave 50% of all unpaved roads at facilities with pits, and 65% of all unpaved roads at facilities without pits. All remaining unpaved roads would be controlled by dust suppressants (assumed 85% control), and the following maintenance will be applied to the newly paved roads. | | | | |
| Sweeping (90% control) | 381,706 (190.9) | 123,614 (61.8) | 18.6% | 32.4% |
| Watering (95% control) | 381,706 (190.9) | 142,066 (71.0) | 21.4% | 37.2% |
| Wet Sweeping (98% control) | 381,706 (190.9) | 153,138 (76.6) | 23.0% | 40.1% |
| Foaming (99% control) | 381,706 (190.9) | 156,829 (78.4) | 23.6% | 41.1% |

*Technical Feasibility*

There are four types of haul roads typically found at a facility: main entry/exit loop, major material haul roads, minor material haul roads, and pit roads. Minor material haul roads and pit roads are not feasible to pave because they are constantly changing. The facilities with haul roads can be divided into two groups, those facilities with open pits and those facilities without open pits. It has been conservatively assumed that sources with open pits can feasibly pave only 50% of their haul roads while sources without open pits can feasibly pave 65% of their haul roads. It is assumed that all entry/exit loops for both defined facilities can be paved.

*Auxiliary Advantages/Disadvantages*

***Advantages.*** Paving is a permanent control measure that is performed one time and does not require daily maintenance. It allows for less trackout from the facility and allows the facility to ensure compliance

***Disadvantages.*** Chemical foams can have a negative affect on vegetation and wildlife. Paving introduces oils to the soil.

*Cost-Effectiveness*

Costs for unpaved road treatment were estimated in the 1997 South Coast Air Quality Management District (SCAQMD) Rule 1186 staff report to be $350,000 per mile of paved road, $16,107 per mile using chemical stabilizers, $800 total per mile for speed limit reduction based upon $200 per sign and 4 signs per mile.

The overall cost-effectiveness of SCAQMD Rule 1186 unpaved road treatment requirements was

estimated at $958 per ton of $PM_{10}$ reduction.

*BACM/MSM Analysis*

Table 4.3.4.12 outlines current control measures, benchmarked control measures, and additional recommended control measures for unpaved haul and access roads. Currently, MCESD Rule 310 regulates all unpaved haul/access roads at industrial and construction sources; however, these recommended changes are additional control measures that are proposed as MSM for MCESD Rule 316. Because Rule 310 already applies to emissions from this source category, the intent is only to augment and supplement those controls that already exist. All portions of 310 that are currently applicable to this source category will remain applicable to this source category unless a more stringent measure is identified.

*BACM and MSM Not Recommended for Consideration*

Of the BACM and MSM measures that have been benchmarked, these additional measures have been considered but are not proposed for inclusion in Rule 316 as they are either duplicative of other measures that are being proposed for adoption into Rule 316, or they are as stringent, or less stringent than other measures that have been proposed for adoption into Rule 316.

***Vehicular Speed Limit:***

*Clark County, Nevada - AQR 94 and Construction Activities Dust Control Handbook*

***Control of Unpaved Haul and Access Roads:***

*TCEQ Concrete Batch Plant Technical Guidelines for Mechanical Sources*

*TCEQ Air Quality Standard Permit for Temporary Rock Crushers*

*TCEQ February 2002, standard permit for rock crushing plants, BACT Analysis*

*TCEQ Air Quality Standard Permit for Hot Mix Asphalt Plants Effective Date July 10, 2003*

*TAC §111.147. Roads, Streets, and Alleys*

*TCEQ Air Quality Standard Permit for Concrete Batch Plants, Effective July 10, 2003*

The following table outlines current control measures, benchmarked control measures, and additional recommended controls measures for unpaved haul and access roads. Currently, Maricopa County Rule 310 regulates all industrial sources and construction sources; however these recommended changes are additional control measures that are proposed as MSM for Maricopa County Rule 316. Because Rule 310 already applies to emissions from this source category, the intent is only to augment and supplement those controls that already exist. All portions of 310 that are currently applicable to this source category will remain applicable to this source category unless a more stringent measure has been identified.

**Table 4.3.4.12 Maricopa County Rule 310: UNPAVED HAUL AND ACCESS ROADS**

| Current Rule 310 Controls | Benchmarked Controls | Recommended Augmentations to Rule 316 |
|---|---|---|
| Applies to owner/operator of any unpaved haul/access road | ----- | Applies to owner/operator of any unpaved haul/access road |
| No visible dust emissions from unpaved Haul/Access Roads which exceed 20% opacity and not allowing a silt loading equal to or greater than 0.33 ounce per square foot. | None | No visible dust emissions from unpaved Haul/Access Roads which exceed 20% opacity and not allowing a silt loading equal to or greater than 0.33 ounce per square foot. |
| As an alternative to meeting the stabilization requirements for an unpaved haul/access road, limit vehicle trips to no more than 20 per day and limit vehicle speeds to no more than 15 miles per hour. | Reduce Speed Limit from 15 to 10 mph | As an alternative to meeting the stabilization requirements for an unpaved haul/access road, limit vehicle trips to no more than 20 per day and limit vehicle speeds to no more than 10 miles per hour. |
| | | |

| Table 4.3.4.12 Maricopa County Rule 310: UNPAVED HAUL AND ACCESS ROADS | | |
|---|---|---|
| **Current Rule 310 Controls** | **Benchmarked Controls** | **Recommended Augmentations to Rule 316** |
| Implement one or more control measure(s) before engaging in the use of or in the maintenance of unpaved haul/access roads:<br>• Limit vehicle speed to 15 miles per hour or less and limit vehicular trips to no more than 20 per day (total for all unpaved haul/access roads);<br>• Apply water so that the surface is visibly moist and opacity limitation and silt loading requirement described above is met;<br>• Pave;<br>• Apply and maintain gravel, recycled asphalt, or other suitable material ensuring compliance with opacity limitation and silt loading requirement described above.; or<br>• Apply a suitable dust suppressant ensuring compliance with opacity limitation and silt loading requirement described above. | None<br><br>Use of bumps, humps, or dips for speed control<br><br>TCEQ – Requirements for Concrete Batch Plant Roads Located no less than 25 feet from property line, except for entrance and exit to the site. | • Implement one or more control measure(s) before engaging in the use of, or in the maintenance of, unpaved haul/access roads:<br>o Control Requirements<br>o Work Practice Standards<br>o Use bumps, humps, or dips for speed control; and Limit vehicle speed to 10 miles per hour or less; and Limit vehicle trips to no more than 20 per day; or<br>o Apply water so that the surface is visibly moist and that opacity and silt loading limitations described in this requirement are met; or<br>o Pave; or<br>o Apply and maintain gravel, recycled asphalt, or other suitable material, in compliance with Maricopa County Rule 310 § 302.2; or<br>o Apply a suitable dust suppressant, in compliance with Maricopa County Rule 310, § 302.2 (and restated in Rule 310, Table 3).<br><br>• Set Back Requirements:<br><br>• Require all new facilities to locate unpaved roads no less than 25 feet from property line, except for entrance and exit to the site. |

| Table 4.3.4.12 Maricopa County Rule 310: UNPAVED HAUL AND ACCESS ROADS | | |
|---|---|---|
| **Current Rule 310 Controls** | **Benchmarked Controls** | **Recommended Augmentations to Rule 316** |
| The owner and/or operator of a dust generating operation shall do all of the following:<br><br>• Install, maintain and use a suitable trackout control device (examples of trackout control devices are described in Table 17 – Trackout Control of this rule) that controls and prevents trackout and/or removes particulate matter from tires and the exterior surfaces of haul trucks and/or motor vehicles that traverse such operation at all exits onto paved areas accessible to the public.<br>  • All work sites with a disturbed surface area of two acres or larger, and<br>  • All work sites where 100 cubic yards of bulk materials are hauled on-site and/or off-site per day.<br><br>• Clean up, trackout, carry-out, spillage, and/or erosion, on the following time-schedule:<br>  • Immediately, when trackout, carry-out, or spillage extends a cumulative distance of 25 linear feet or more; and<br>  • At the end of the workday, for all other trackout, carry-out, spillage, and/or erosion. | SCAQMD - Use of trackout controls such as wheel washers, rumble grates, or an equivalent trackout device.<br><br>Use of trackout controls should consider the stabilization of the roads and unpaved shoulders that off-site traffic must cross in order to enter the facility. | The owner and/or operator of a dust generating operation shall do all of the following:<br><br>• Install, maintain and use a wheel washing system, rumble grate or other equivalent trackout control device (examples of other possible trackout control devices are described in Table 17 – Trackout Control of this rule) that controls and prevents trackout and/or removes particulate matter from tires and the exterior surfaces of haul trucks and/or motor vehicles that traverse such operation at all exits onto paved areas accessible to the public.<br><br>• The appropriate trackout controls shall be determined after considering the stabilization of the roads and any unpaved shoulders that off-site traffic must cross in order to enter and exit the facility, and shall be deemed acceptable through an approvable dust control plan.<br><br>• Clean up, trackout, carry-out, spillage, and/or erosion, on the following time-schedule:<br>  o Immediately, when trackout, carry-out, or spillage extends a cumulative distance of 25 linear feet or more; and<br>  o At the end of the workday, for all other trackout, carry-out, spillage, and/or erosion. |

| Table 4.3.4.12 Maricopa County Rule 310: UNPAVED HAUL AND ACCESS ROADS | | |
|---|---|---|
| **Current Rule 310 Controls** | **Benchmarked Controls** | **Recommended Augmentations to Rule 316** |
| ---- | **Entrance and Exit Roads –** Require all entry and exit roads and main traffic routes associated with the operation to be paved with a cohesive hard surface that is maintained intact and cleaned (exceptions from paving for temporary plants – 180 day or less) | Require all entry and exit roads and main traffic routes associated with the operation to be paved with a cohesive hard surface that is maintained intact and cleaned, or controlled through the use of 1" rock, or recycled asphalt when paving is determined to be technically infeasible, as approved in dust control plan. (There may be exceptions from paving for temporary plants – 180 day or less). |
| ---- | **Delivery and Batch Truck Operations –** Require all batch trucks and material delivery trucks to remain on paved surfaces when entering, conducting primary function, and leaving the property. | Require all batch trucks and material delivery trucks to remain on controlled surfaces when entering, conducting primary function, and leaving the property, as approved in a dust control plan. |
| ---- | **Dust Emissions from In-Plant Roads and Traffic –** Minimize dust emissions from all other in-plant roads and traffic areas at all times by at least one of the following methods:<br><br>(i) Cover with a material such as, but not limited to, roofing shingles or tire chips (when used in combination with (ii) or (iii) of this subsection);<br>(ii) Treat with dust suppressant chemicals;<br>(iii) Water; or<br>(iv) Pave with a cohesive hard surface that is maintained intact and cleaned. | Minimize dust emissions from all other in-plant roads and traffic areas at all times by at least one of the following methods:<br><br>(i) Cover with a material such as, but not limited to, roofing shingles or tire chips (when used in combination with (ii) or (iii) of this subsection;<br>(ii) Treat with dust suppressant chemicals;<br>(iii) Water; or<br>(iv) Pave with a cohesive hard surface that is maintained intact and cleaned. |

| Table 4.3.4.12 Maricopa County Rule 310: UNPAVED HAUL AND ACCESS ROADS | | |
|---|---|---|
| **Current Rule 310 Controls** | **Benchmarked Controls** | **Recommended Augmentations to Rule 316** |
| ---- | **Stabilization Requirements for Unpaved Areas –** Stabilize surface soils where loaders, support equipment and vehicles will operate by prewatering and maintaining surface soils in a stabilized condition; or by applying and maintaining a dust palliative on surface soils | Stabilize surface soils where loaders, support equipment and vehicles will operate by prewatering and maintaining surface soils in a stabilized condition; or by applying and maintaining a dust palliative on surface soils. |
| --- | **No Visible Emissions at the Fence Line -** No person shall cause, suffer, allow, or permit diffusion of visible emissions, including fugitive dust, beyond the property boundary line within which the emissions become airborne, without taking reasonably necessary and feasible precautions to control generation of airborne particulate matter. Sources may be required to cease temporarily the activity or operation which is causing or contributing to the emissions until reasonably necessary and feasible precautions are taken. | No person shall cause, suffer, allow, or permit diffusion of visible emissions, including fugitive dust, beyond the property boundary line within which the emissions become airborne, without taking reasonably necessary and feasible precautions to control generation of airborne particulate matter. Sources may be required to cease temporarily the activity or operation which is causing or contributing to the emissions until reasonably necessary and feasible precautions are taken. |

***Opacity Limitation:***

*San Joaquin Valley Air Pollution Control District (SJVAPCD) Rule 8071 Unpaved Vehicle/Equipment Traffic Areas*

***Fugitive Emissions From Concrete Batching Operations:***

*Florida Administrative Code 62-296.414 Concrete Batching Plants*

*Selected Control Measures for Unpaved Haul and Access Roads*

Currently, MCESD Rule 310 regulates all unpaved haul/access roads at industrial and construction sources; however, below are additional control measures that are proposed as MSM for MCESD Rule 316. Augmentation of Rule 316 to include the portions of Rule 310 that are relevant to unpaved haul and access roads has been selected as a control measure. The following are additional selected control measures:

***Entrance and Exit Roads.*** Require all entry and exit roads and main traffic routes associated with an operation to be paved with a cohesive hard surface that is maintained intact and cleaned except when it is determined to be technically infeasible or unreasonable. The determination of infeasibility or unreasonableness will consider the stabilization of roads and shoulders leading to the access point and will be made as part of a dust control plan.

***Dust Emissions from In-Plant Roads and Traffic.*** Truck traffic that enters and exits a facility will remain on controlled surfaces. Controls include paving, dust suppressants, or watered roads consistent with an approved dust control plan. No visible dust emissions from unpaved roads that exceed 20% opacity. Silt loading equal to or greater than 0.33 ounce per square foot is prohibited.

***Stabilization Requirements for Unpaved Areas.*** Surface soils where loaders, support equipment and other vehicles will operate will be stabilized by applying water or dust suppressants. As an alternative, vehicle trips can be limited to no more than 20 per day and vehicle speeds to no more than 10 mph.

***Trackout Controls.*** Install , maintain, and use a wheel washing system, rumble grate, or other equivalent trackout control device that prevents trackout and removes particulate matter from tires and exterior surfaces of haul trucks and/or motor vehicles at all exits onto paved areas accessible to the public. Clean up, trackout, spillage, and/or erosion will be removed: 1) immediately when spillage extends a cumulative distance of 50 linear feet or more or 2) at the end of the work day, for all other trackout.

***Minimum Distance from Fence Line.*** Unpaved roads at new facilities are required to be located no fewer than 25 feet from the property line, except for entrance and exit to the site.

***No Visible Emissions at the Fence Line.*** No visible emissions are allowed beyond the property boundary line without taking reasonably necessary and feasible precautions to control generation of airborne particulate matter. Sources may be required to cease temporarily the activity or operation which is causing or contributing to the emissions.

***Delivery and Batch Truck Operations.*** All batch trucks and material delivery trucks will remain on controlled surfaces when entering, conducting their primary function, and leaving the property as described in an approved dust control plan.

***Control Requirements.*** Various other controls for unpaved roads including bumps, humps, and dips, limitations on vehicle speed, surface stabilization, opacity and silt loading limitations, and paving as described in Table 4.3.4.12.

## ***Other Industrial Sources***

Permitted industrial point (stack) sources in the Salt River SIP Study Area were evaluated for compliance with BACM/MSM. Of all industrial point sources evaluated, control measures on all facilities met BACM/MSM except brick and structural clay product manufacturing and cooling towers. Evaluations of these sources are` described below.

### ***Brick and Structural Clay Product Manufacturing***

*Background*

Brick, and structural clay products manufacturing facilities typically process raw clay and shale, form the processed materials into bricks or shapes, and dry and fire the bricks or shapes. As part of brick and clay products manufacturing, kilns are used for high temperature firing. The most common type of kiln used for firing brick is the tunnel kiln. During the kiln firing, a significant amount of particulate matter emissions is generated.

There are several types of sources that generate particulate matter emissions during the brick and clay products manufacturing process. These sources include, but are not limited to, raw material grinding, screening operations, kiln firing, brick dryers, facility paved roads, unpaved roads, and stockpiles.

*BACM/MSM Analysis*

Table 4.3.4.13 outlines current control measures, benchmarked control measures, and additional recommended control measures for and brick and structural clay product manufacturing facilities. Currently, MCESD Rule 311 regulates operations that emit particulate matter emissions into the ambient air as a result of processing materials that are not otherwise required to be controlled through MCESD Rules 313, 316, 317, 319, 322, and 323 or other applicable New Source Performance Standard (NSPS) or National Emission Standard for Hazardous Air Pollutants (NESHAP). Because brick and structural clay manufacturers number among those industries unregulated by MCESD particulate rules the intent is to recommend the adoption of a rule regulating emissions from brick and clay manufacturers. MCESD has proposed, and is in the process of developing, Maricopa County Rule 325, which will address brick and clay sources.

The following table outlines current control measures, benchmarked control measures, and additional recommended control measures for brick and structural clay product manufacturing facilities. Currently, Maricopa County Rule 311 regulates operations that emit particulate matter emissions into the ambient air as a result of processing materials that are not otherwise required to be controlled through Maricopa County Rules 313, 316, 317, 319, 322 and 323 or other applicable New Source Performance Standard (NSPS) or National Emission Standard for Hazardous Air Pollutants (NESHAP). Because there is no other applicable requirement to emissions from this source category, the intent of the document is to recommend the adoption of a new rule regulating emissions from brick and structural clay product manufacturing facilities.

**Table 4.3.4.13 BRICK OR STRUCTURAL CLAY PRODUCTS MANUFACTURING**
**Maricopa County Rule 325: Particulate Emissions Not Otherwise Controlled**

| Current Maricopa County Rule 311 Controls | Benchmarked Controls | Recommended New Requirements |
|---|---|---|
| • **Process Weight Rates Less Than or Equal to 60,000 Pounds Per Hour:**<br><br>Determination of the allowable hourly emission rates (E) for process weight rates up to 60,000 lbs/hr shall be accomplished by use of the equation:<br><br>$E = 3.59\ P^{0.62}$ (P = less than or equal to 30 tons/hr)<br><br>where:<br><br>E = Emissions in pounds per hour, and<br>P = Process weight rate in tons per hour.<br><br>• **Process Weight Rates Greater Than 60,000 Pounds Per Hour:**<br><br>Determination of the allowable hourly emission rates (E) for process weight rates in excess of 60,000 lbs/hr shall be accomplished by the use of the equation:<br><br>$E = 17.31\ P^{0.16}$ (P = greater than 30 tons/hr)<br><br>where "E" and "P" have the same meanings as above. | **40 CFR 63.8405(a) Subpart JJJJJ -** Each existing, new, or reconstructed tunnel kiln at a brick or structural clay product manufacturing facility with a capacity less than 10 tons per hour (tph) of fired product shall not have particulate emissions that exceed 0.42 pounds per ton (lb/ton) of fired product. | Each existing, new, or reconstructed tunnel kiln at a brick or structural clay product manufacturing facility with a capacity less than 10 tons per hours (tph) of fired product shall not have particulate emissions that exceed 0.42 pounds per ton (lb/ton) of fired product. |

**Brick and Structural Clay Product Manufacturing Facilities.**

***Cooling Towers***

*Background*

During the BACM/MSM review on industrial point sources, ADEQ considered the emissions from cooling towers at electrical generating units in order to determine whether additional $PM_{10}$ emissions reductions might be possible. The most commonly accepted controls for $PM_{10}$ emissions from cooling towers include the installation of high efficiency drift eliminators and the control of total dissolved solids (TDS) in the water used in cooling towers.

*BACM/MSM Analysis*

A review of Maricopa County's existing power plant rule, MCESD Rule 322 § 301.3, determined that electrical generating units inside the non-attainment area are already required to install high efficiency drift eliminators on all cooling towers and to control the TDS concentration in the re-circulated cooling water. In addition, the Arizona Department of Water Resources (ADWR) has established a requirement in the Phoenix Active Management Area Plan for existing cooling towers at electrical generating units to recycle the water used by such towers a minimum of seven times. New cooling towers are required to recycle the water additional times (beyond the seven required for existing cooling towers) or be equipped with a technology that helps reduce the amount of water used by the process (*Third Management Plan for the Phoenix Active Management Area, 2000 – 2010*, Arizona Department of Water Resources, December 1999, pp 6-65 through 6-72).

ADEQ confirmed that high efficiency drift eliminators are, in fact, installed on all electrical generating unit cooling towers in the Salt River SIP Study Area. ADEQ further evaluated the possibility of setting specific, county-wide TDS concentration limits for these facilities that are lower than the maximum 12,000 TDS allowed by the Arizona Pollutant Discharge Elimination System (AZPDES) Arizona Administrative Code, Title 18, Chapter 9, Article 9. These facilities, however, have been designed to meet the 12,000 TDS maximum and are unable from an engineering standpoint to operate at a significantly lower TDS level.

Because the electrical generating units inside the non-attainment area have installed high efficiency drift eliminators on all cooling towers, because they are meeting ADWR and AZPDES requirements, and because lowering TDS concentration limits is technically, legally, and/or economically infeasible, these facilities are already meeting BACM/MSM requirements.

### 4.3.5 On-Road Mobile Source Control Measures

***Paved Roads***

*Background*

The most significant sources of $PM_{10}$ emissions in the Salt River Study Area related to paved roads are dust loading from windblown emissions, soil trackout and emissions from earth moving and other dust generating processes in areas of high industrial, construction, and agricultural activity. Dust loading is, essentially, the amount of particulate matter deposited on roadways and available for reentrainment That fraction of the dirt and dust on the pavement smaller than 75 microns is

called the silt loading, which is the particulate matter available for reentrainment. This fine particulate matter becomes reentrained to the atmosphere as a result of vehicular traffic. It is not possible, however, to prevent only the silt from being deposited on the roadway without the rest of the particulate materials.

Trackout refers to material deposited on primary and secondary roads as a result of vehicles traveling over disturbed soils; accumulating mud, dirt, and debris on their tires and other exterior surfaces; and subsequently entering and traveling upon paved roads. Once soil has been tracked out of the original disturbed soil area and onto paved roads, vehicles repeatedly traveling over the affected area suspend the soil as fine particles of particulate matter or dust, much of which becomes suspended in the atmosphere.

*Selected Control Measures*

The potential control measures to address the problems of silt loading and trackout on paved roads are enhanced enforcement of MCESD Rules 310 and 316 and implementation of agency- and political subdivision-specific control measures for dust emissions from targeted paved roads in the Salt River Study Area and the Maricopa County $PM_{10}$ Nonattainment Area.

***Enhanced Enforcement of Rules 310 and 316.*** Because most heavy silt loading and trackout on roadways is a result of industrial, construction, and agricultural activities, enhanced enforcement of MCESD Rule 310 pertaining to fugitive dust and augmentation of MCESD Rule 316 pertaining to industrial sources are proposed as control measures. For Rule 316 specifically, potential augmentations require the installation, maintenance, and use of a wheel washing system, rumble grate, or equivalent trackout control device that removes particulate matter from tires and the exterior surfaces of haul trucks and/or motor vehicles that traverse the operation at all exits onto paved areas.

Additionally, Rule 316 will be augmented to include requirements for cleanup of trackout, carry-out, spillage, and/or erosion to occur: 1) immediately if the trackout extends a cumulative distance of 25 linear feet or more or 2) at the end of the work day for all other trackout. The recommended augmentations for trackout/carryout are further described in Table 4.3.4.12 which addresses unpaved haul and access roads.

Currently, Rule 310 regulates dust-generating operations; however, the recommended changes are additional control measures that are proposed as MSM for MCESD Rule 316. Because Rule 310 already applies to emissions from this source category, the intent is only to augment and supplement those controls that already exist. All portions of Rule 310 that are currently applicable to this source category will remain applicable to this source category.

***Control Measure for Reentrained Dust Emissions from Targeted Paved Roads.*** In addition to enhanced enforcement of MCESD 310 and augmentation of MCESD Rule 316, control measures will be developed that address dust emissions from paved roads that typically experience a high level of soil and dust deposition. A protocol for identifying these arterial and collector roadway segments will be developed and implemented by the Arizona Department of Transportation and Maricopa County, and cities, and towns. Each agency and political subdivision shall develop its own protocol for implementation. The protocol shall:

- Identify targeted arterial and collector roadways and assign sweeping

frequencies with $PM_{10}$-efficient sweepers (or conventional sweepers if only these are available) or other control measures that would reduce the dust loading for each roadway;

- Describe how the protocol constitutes an enhancement or improvement over the commitment made in the Revised MAG 1999 Serious Area Particulate Plan for $PM_{10}$ for the Maricopa County Nonattainment Area (February 2000);

- Address trackout associated with facilities and activities regulated by Maricopa County, by notifying the County when rule violations are observed; and

- Provide for the periodic reevaluation of the protocol. The reevaluation shall be conducted annually unless the protocol includes a justification for a different frequency.

In developing the protocol, jurisdictions shall consider activities and conditions that exist in that jurisdiction that contribute to $PM_{10}$ loading. Examples of factors that may be considered include: land use, overall traffic volume, heavy duty truck traffic, unpaved shoulders, and others. The protocol shall be sent to MCESD and ADEQ no later than September 30, 2004 and implemented no later than February 2, 2005. Reevaluations shall be prepared in writing and submitted to MCESD and ADEQ, and shall include a revised protocol, if appropriate.

***Unpaved Shoulders***

Road shoulders have multiple functions including accommodating stopped vehicles, providing support to the edge of the traveled portion of the roadway, protecting the road structure from water and erosion, and facilitating access by emergency vehicles. If road shoulders are not paved or otherwise treated to suppress dust, high-profile vehicle traffic can generate a significant amount of $PM_{10}$ from pavement and unpaved shoulders.

To address this issue, the *Revised MAG 1999 Serious Area Particulate Plan for $PM_{10}$ for the Maricopa County Nonattainment* Area (February 2000) included in the committed measures a measure titled, "Reduce Particulate Matter Emissions from Unpaved Shoulders on Targeted Arterials." Because unpaved shoulders are a significant source category in the Salt River SIP Study Area, the control measure commitments in the MAG Plan will continue to be relied upon in achieving attainment. These committed measures are shown in Appendix E.

### 4.3.6 Summary of Selected Control Measures

***Windblown Construction***

The selected control measure for dust from windblown construction is better enforcement of MCESD Rule 310 pertaining to the control of fugitive dust. The measures available under Rule 310 to control windblown dust emissions from disturbed areas include opacity restrictions, the use of water or dust suppressants, and the installation of wind barriers. Temporary measures during weekends, after work hours, on holidays or during high wind events include applying water, dust suppressants, or gravel and restricting vehicular access.

A critical aspect of strengthening enforcement of the Rule 310 control measures as well as the control measures in Rules 310.01 and 316 is the hiring of additional inspectors to support the enforcement program. An additional 25-30 inspectors may be needed to provide adequate enforcement.

***Windblown - Open Areas, Vacant Lots, and Alluvial Channel***

The selected control measure for windblown dust from open areas and vacant lots is better enforcement of MCESD Rule 310.01 pertaining to the control of fugitive dust. Current control options include establishing/restoring vegetative cover, applying gravel, river rock, broken concrete, or dust suppressants, creating barriers to trespassing, and establishing wind breaks. A recommended augmentation to Rule 310.01 is the addition of wind breaks as a control measure. The most significant control method appears to be the application of barriers to prevent vehicular trespassing that, if not prevented, results in the destruction of vegetative ground cover and soil stabilization. As described above, a critical aspect of strengthening enforcement of Rule 310.01 is hiring additional inspectors.

***Windblown – Agricultural***

The selected control measures to minimize windblown $PM_{10}$ emissions from agricultural fields are the Agricultural BMPs described above and as specified in the Agricultural $PM_{10}$ General Permit for the Maricopa County $PM_{10}$ Nonattainment Area and codified in Arizona Administrative Code (AAC) R18-2-611. A commercial farmer is required to implement at least one BMP from each of the three agricultural categories: tillage and harvest, non-cropland, and cropland. AAC R18-2-611 is considered BACM/MSM for the windblown agricultural emissions source category.

***Non-Metallic Mineral Processing***

Currently, MCESD Rule 316 regulates this source category. MCESD Rule 316 is modeled after the New Source Performance Standard (NSPS), 40 CFR 60 Subpart OOO titled, “Standards of Performance for Nonmetallic Mineral Processing Plants.” The recommended changes are additional control measures that are proposed as MSM for MCESD Rule 316. Augmentation of Rule 316 to include the portions of Rule 310 that are relevant to non-metallic mineral product processing is a selected control measure in addition to the following measures:

***Crushing And Screening Plants***

*No Visible Emissions Standard.* No visible fugitive emissions shall leave the property from the crusher, associated sources, and in-plant roads associated only with the facility. This rule applies only to onsite operations.

*Permanently Mounted Watering Systems.* Permanently mounted spray bars are required at the inlet and outlet of all crushers, all shaker screens, and at all material transfer points.

*Side Covers for Screens.*

***Concrete Batch Plants***

*Cement Silo Baghouse, Fabric Filter or Cartridge Filter Requirement.* New baghouses are required to be designed to meet a 0.01 gr/dscf standard.

*Cement Silo Filling Requirements.* A control system that shuts off the cement silo filling process if pressure from the delivery truck reaches excessive levels.

*Cement Silo Overfill Warning System.* An audible or visual system is required.

*Spilled Material Work Practice Standard.* Spilled material must be immediately removed or controlled by water or another suppressant.

*Batch Mix Feed Controls.* Dust emissions at the batch mixer feed shall be controlled by a spray device, rubber fill tubes, a baghouse capture and delivery system, or by conducting the entire mixing operation inside an enclosed process building such that no visible emissions from the building occur during mixing activities.

***Asphalt Batch Plants***

*Baghouse Controls for Drum Dryers.* A baghouse is required on the drum dryer and silos with an opacity limit of not greater than 5% over a six-minute period.

*Opacity Requirement.* The opacity requirement for non-rubberized asphalt plants is 5 percent.

*Filler Silo Overfill Warning System.* An audible or visual overfill warning system is required for lime and other filler silos to alert operators in sufficient time prior to the silo reaching capacity.

A complete listing of potential Rule 316 augmentations is included in Tables 4.3.4.7 – 4.3.4.9.

***Windblown Cleared Areas - Industrial***

If a nonmetallic mineral product mining and processing facility does not have an earthmoving permit, the potential control measure for the areas subject to wind erosion is augmentation and better enforcement of MCESD Rule 316 for industrial sources. Currently, MCESD Rule 310 regulates all dust generating operations; however, the following recommended change is an additional control measure that is proposed as MSM for MCESD Rule 316:

> Stabilize surface soils where loaders, support equipment, and vehicles will operate by prewatering and maintaining surface soils in a stabilized condition, or by applying and maintaining a dust palliative on surface soils.

Because Rule 310 already applies to emissions from this source category, the intent is only to augment and supplement those controls that already exist. All portions of 310 that are currently applicable to this source category will remain applicable to this source category unless a more stringent measure is identified.

If an industrial facility has an earthmoving permit, the potential control measure for the areas subject to wind erosion is better enforcement of MCESD Rule 310 pertaining to the control of fugitive dust. A critical aspect of strengthening enforcement of the Rule 310 control measures is hiring 25-30 additional inspectors for the entire program (this includes resources for the enforcement of Rule 316 pertaining to industrial sources).

The methods available under Rule 310 to control windblown dust emissions from disturbed areas include opacity restrictions, the use of water or dust suppressants, and the installation of wind barriers. Temporary measures to be implemented during weekends, after work hours, on holidays or high wind events include applying water, dust suppressants, or gravel, and restricting vehicular access.

***Stockpiles***

The selected control measures for stockpile emissions are augmentation of Rule 316 to include the portions of Rule 310 that are relevant to stockpile and material handling emissions. The following control measures are also selected:

> *No visible emissions beyond property line.* A person shall not cause or allow the emissions of fugitive dust from any active operation, open stockpile, or disturbed surface area such that the presence of such dust remains visible in the atmosphere beyond the property line of the emission source. There is an exemption for wind gusts exceeding 25 mph, if high wind control measures are implemented. High wind control measures for open stockpiles include applying water twice per hour and installing temporary covering.
>
> *Surface Stabilization*. Stabilize surface soils where loaders, support equipment, and other vehicles will operate by pre-watering and maintaining surface soils in a stabilized condition; or by applying and maintaining a dust palliative on surface soils.
>
> *Distance from fence line and height limitations.* Stockpiles at new pits must be located a minimum distance from the fence line. Stockpiles with less than a 5 percent silt content are limited to 45 feet in height.

A complete listing of proposed Rule 316 augmentations for stockpiles is included in Table 4.3.4.10.

***Unpaved Haul and Access Roads***

Augmentation of Rule 316 to include the portions of Rule 310 that are relevant to unpaved haul and access roads has been selected as a control measure.

The following are additional selected control measures:

> *Entrance and Exit Roads.* Require all entry and exit roads and main traffic routes associated with an operation to be paved with a cohesive hard surface that is maintained intact and cleaned except when it is determined to be technically infeasible or unreasonable. The determination of infeasibility or unreasonableness will consider the stabilization of roads and shoulders leading to the access point and will be made as part of a dust control plan.
>
> *Dust Emissions from In-Plant Roads and Traffic.* Truck traffic that enters and exits a facility will remain on controlled surfaces. Controls include paving, dust suppressants, or watered roads consistent with an approved dust control plan. No visible dust emissions from unpaved roads that exceed 20% opacity. Silt loading equal to or greater than 0.33 ounce per square foot is prohibited.

*Stabilization Requirements for Unpaved Areas.* Surface soils where loaders, support equipment and other vehicles will operate will be stabilized by applying water or dust suppressants. As an alternative, vehicle trips can be limited to no more than 20 per day and vehicle speeds to no more than 10 mph.

*Trackout Controls.* Install , maintain, and use a wheel washing system, rumble grate, or other equivalent trackout control device that prevents trackout and removes particulate matter from tires and exterior surfaces of haul trucks and/or motor vehicles at all exits onto paved areas accessible to the public. Clean up, trackout, spillage, and/or erosion will be removed: 1) immediately when spillage extends a cumulative distance of 50 linear feet or more or 2) at the end of the work day, for all other trackout.

*Minimum Distance from Fence Line.* Unpaved roads at new facilities are required to located no less than 25 feet from the property line, except for entrance and exit to the site.

*No Visible Emissions at the Fence Line.* No visible emissions are allowed beyond the property boundary line without taking reasonably necessary and feasible precautions to control generation of airborne particulate matter. Sources may be required to cease temporarily the activity or operation which is causing or contributing to the emissions.

*Delivery and Batch Truck Operations.* All batch trucks and material delivery trucks will remain on controlled surfaces when entering, conducting their primary function, and leaving the property as described in an approved dust control plan.

*Control Requirements.* Various other controls for unpaved roads including bumps, humps, and dips, limitations on vehicle speed, surface stabilization, opacity and silt loading limitations, and paving as described in Table 4.3.4.12.

***Brick and Structural Clay Product Manufacturing***

Currently, MCESD Rule 311 regulates operations that emit particulate matter emissions into the ambient air as a result of processing materials that are not otherwise required to be controlled through MCESD Rules 313, 316, 317, 319, 322, and 323, or other applicable New Source Performance Standard (NSPS) or National Emission Standard for Hazardous Air Pollutants (NESHAP). Because there is no other applicable requirement to emissions from this source category, the intent is to recommend the adoption of a new rule regulating emissions from brick and structural clay product manufacturing facilities.

Specific recommendations include: each tunnel kiln at brick and structural clay manufacturing facilities shall not have particulate matter emissions that exceed 0.42 pound per ton of fired product, and 2) tunnel kilns at brick or structural clay product manufacturing facilities with a capacity < 10 tons/hr of fired product shall not have particulate matter emissions that exceed 0.42 lb/ton of fired product.

***Paved Roads***

The potential control measures to address the problems of dust loading and trackout on paved roads are enhanced enforcement of MCESD Rules 310 and 316 and implementation of agency- and political subdivision-specific control measures for dust emissions from targeted paved roads in the both the Salt River $PM_{10}$ Study Area and the Maricopa County $PM_{10}$ Nonattainment Area..

*Enhanced Enforcement of Rules 310 and 316.* Because most heavy silt loading and trackout on roadways is a result of industrial, construction, and agricultural activities, enhanced enforcement of MCESD Rule 310 pertaining to fugitive dust and augmentation of MCESD Rule 316 pertaining to industrial sources are proposed as control measures. For Rule 316 specifically, augmentations requiring the installation, maintenance, and use of a wheel washing system, rumble grate, or equivalent trackout control device that removes particulate matter from tires and the exterior surfaces of haul trucks and/or motor vehicles that traverse the operation at all exits onto paved areas.

Additionally, Rule 316 would be augmented to include requirements for cleanup of trackout, carry-out, spillage, and/or erosion to occur: 1) immediately if the trackout extends a cumulative distance of 50 linear feet or more or 2) at the end of the work day for all other trackout. The recommended augmentations for trackout/carryout are further described in Table 4.3.4.12 which addresses unpaved haul and access roads.

Currently, Rule 310 regulates dust-generating operations; however, the recommended changes are additional control measures that are proposed as MSM for MCESD Rule 316. Because Rule 310 already applies to emissions from this source category, the intent is only to augment and supplement those controls that already exist. All portions of Rule 310 that are currently applicable to this source category will remain applicable to this source category unless a more stringent measure is identified.

*Control Measure for Reentrained Dust Emissions from Targeted Paved Roads.* In addition to enhanced enforcement of MCESD 310 and augmentation of MCESD Rule 316, control measures will be developed that address dust emissions from paved roads that typically experience a high level of soil and dust deposition. A protocol for identifying these arterial and collector roadway segments will be developed and implemented by the Arizona Department of Transportation and Maricopa County, and cities, and towns. Each agency and political subdivision shall develop its own protocol for implementation. The protocol shall:

- Identify targeted arterial and collector roadways and assign sweeping frequencies with $PM_{10}$-efficient sweepers (or conventional sweepers if only these are available) or other control measures that would reduce the dust loading for each roadway;

- Describe how the protocol constitutes an enhancement or improvement over the commitment made in the Revised MAG 1999 Serious Area Particulate Plan for $PM_{10}$ for the Maricopa County Nonattainment Area (February 2000);

- Address trackout associated with facilities and activities regulated by Maricopa County, by notifying the County when rule violations are observed; and

- Provide for the periodic reevaluation of the protocol. The reevaluation shall be conducted annually unless the protocol includes a justification for a different frequency.

In developing the protocol, jurisdictions shall consider activities and conditions that exist in that jurisdiction that contribute to $PM_{10}$ loading. Examples of factors that may be considered

include: land use, overall traffic volume, heavy duty truck traffic, unpaved shoulders, and others. The protocol shall be sent to MCESD and ADEQ no later than September 30, 2004 and implemented no later than February 2, 2005. Reevaluations shall be prepared in writing and submitted to MCESD and ADEQ, and shall include a revised protocol, if appropriate.

***Unpaved Shoulders***

The *Revised MAG 1999 Serious Area Particulate Plan for $PM_{10}$ for the Maricopa County Nonattainment* Area (February 2000) included in the committed measures a measure titled, "Reduce Particulate Matter Emissions from Unpaved Shoulders on Targeted Arterials." Because unpaved shoulders are a significant source category in the Salt River SIP Study Area, the control measure commitments in the MAG Plan will continue to be relied upon in achieving attainment. These committed measures are shown in Appendix E of this plan.

### 4.3.7 BACM and MSM Implementation Schedule

The Salt River $PM_{10}$ SIP will be finalized after the public participation process and submitted to the US EPA prior to August 2, 2004. As a result, all committed control measures must be implemented by February 2, 2005.

The planned MCESD rulemaking schedule is as follows:

| | |
|---|---|
| June 04, 2004 | Docket opening for MCESD Rule 310.01, *Fugitive Dust from Open Areas, Vacant Lots, Unpaved Parking Lots, and Unpaved Roadways,* and Rule 316, *Non-Metallic Mineral Mining and Processing.* |
| July 1, 2004 | First stakeholder workshop for Rule 316. |
| July 8, 2004 | First stakeholder workshop for Rule 310.01. |
| August 5, 2004 | Second pubic workshop for Rule 316. |
| August 12, 2004 | Second public workshop for Rule 310.01; and<br>First public workshop for proposed new Rule 325, *Brick Manufacturing* |
| September 23, 2004 | Second public workshop for proposed new Rule 325 |
| November 4, 2004 | MCESD oral proceeding to set public hearing dates for adoption of proposed revisions to Rules 310.01 and 316 |
| December 9, 2004 | MCESD oral proceeding to set public hearing date for adoption of proposed new Rule 325 |
| February 16, 2005 | MCESD Board of Supervisors public hearing to adopt proposed revisions to Rules 310.01 and 316 |

| | |
|---|---|
| March 2, 2005 | MCESD Board of Supervisors public hearing to adopt proposed new Rule 325 |
| April 2005 | MCESD implements controls that do not require capital expenditures or contract or bid amendments. |
| August 2005 – February 2006 | MCESD implements controls that require capital expenditures. |

The City of Phoenix Agenda for the adoption of SIP commitments and allocation of funds is included as Appendix D. Item #95 on the Agenda is Resolution 20114, *Commitment to Implement Dust Control Measures* citywide. At their regular council meeting on June 16, the City of Phoenix will consider Resolution 20114, which is summarized below:

Resolution 20114 stating the City's intent to implement measures to reduce air pollution.

This Resolution is committing the City to implement measures to reduce dust from paved streets and City-owned properties in the Salt River and similar areas.

Funding to support these measures was submitted for Council approval on June 8, 2004. Because the Resolution will become a legally binding commitment in the Arizona State Implementation Plan for air quality, only a portion of the total program budget has been included in the Resolution.

The Resolution includes:

- Targeted street sweeping and other dust control measures for paved roads that will initially be focused within an area bounded by Van Buren, Baseline, 10th Street, and 51st Avenues. The program may be implemented in other areas as needed.

- Dust control measures on undeveloped City-owned land will initially be focused in the Salt River bed between 35th and 51st Avenues. The measures may be implemented in other areas of the City, if necessary. Dust controls may include installation of signs, increased police enforcement of trespass laws, installation and maintenance of fencing, berms, or other barriers to restrict property access, removal of trash, stabilization of disturbed soils, and other measures.

- Dust mitigation project on 43rd Avenue between Lower Buckeye Road and the riverbed, based upon final approval of federal funds available through Maricopa Association of Governments federal funds. Street improvements will include installation of curb and gutter.

Citizen Notification
No citizen notification is necessary.

Financial Impact
Funding is available in the General Purpose Contingency Fund and the STD Capital

Improvement Program.

This item is recommended by Mr. Washington and the Office of Environmental Programs.

The final resolution stamped by the city clerk will be included in the final SIP.

ADOT, Maricopa County, cities, and towns in the Maricopa County $PM_{10}$ Nonattainment Area will each submit a protocol addressing control measures for dust emissions from targeted paved roads by September 30, 2004. Each protocol is required to be implemented by February 2, 2005.

# Chapter 5: DEMONSTRATION OF ATTAINMENT OF $PM_{10}$ NATIONAL AMBIENT AIR QUALITY STANDARDS

## 5.1 OVERVIEW

Given predicted recurrence of the meteorological conditions described for each of the exceedance design days, TSD Chapter 6, "2006 Predicted Concentrations and Controls," demonstrates that attainment can be achieved for the eight exceedances modeled in 2002 in this analysis, assuming the implementation of the enhanced controls identified in Chapter 4 of this SIP.

## 5.2 PROJECTED EMISSION AND AMBIENT AIR QUALITY CHANGES BETWEEN 2002 AND 2006

Chapter 4 of the TSD describes the predicted base case 2006 $PM_{10}$ emissions in considerable detail. In this Chapter, only the additional controls necessary to meet the standard will be discussed. Emission reductions will be forthcoming from enhanced controls to be placed on five kinds of dust-producing activities:

1. Earthmoving and related activities associated with residential and commercial construction;

2. Industrial activity that is chiefly materials handling and transport, with haul roads, pile forming and material transfer being the principal sources;

3. Vehicular traffic on paved roads, principally the reentrained dust that vehicles generate, which can be reduced through increased street sweeping;

4. Trackout onto paved roads from a variety of sources, which adds to the reentrained dust from the nominally clean roads; and

5. Windblown dust from areas such as alluvial surfaces, vacant lots, miscellaneous disturbed areas, industrial stockpiles, and industrial sites.

In addition to emission reductions from these activities, reductions in windblown emissions will also occur through expected changes in land use, in particular, the conversion of agricultural land, vacant lots, and miscellaneous disturbed areas to residential and commercial uses. Each of these activities contributes $PM_{10}$ to the atmosphere throughout the metropolitan area, and within the Salt River $PM_{10}$ Study Area. Each has some effect on the four monitors within the study area, and the emissions inventory and air quality model has quantified their source category contributions.

State Implementation Plan Chapter 3., "$PM_{10}$ Emissions Inventories," Table 3.2 (Table 4.5 of the TSD) identifies the 2002 Salt River $PM_{10}$ emissions inventory source categories and 2002 estimated $PM_{10}$ emissions for each, in metric tons per day. Technical Support Document, Chapter 4 ("Salt River $PM_{10}$ Emissions Inventory), Table 4-6, reproduced below as SIP Table 5.1, reflects the projected percentage reduction in emissions from significant source categories in the Salt River Study Area, between 2002 and 2006, due to the effect of enhanced control measures and the conversion of vacant and agricultural land to residential and commercial uses.

| TABLE 5.1<br>Percent Change in Emissions Between 2002 and 2006 Attainment Case | | |
|---|---|---|
| **Emission Category** | **Percent Change in Emissions** | **Reason for Change** |
| **AREA SOURCES** | | |
| Agricultural Tilling (Land Preparation) | -80% | Agricultural land projected to decrease 80% due to conversion of agricultural land to residential and commercial uses (Maricopa County Farm Bureau, 2003) |
| Wind Erosion – Agricultural | -80% | Agricultural land projected to decrease 80%, due to conversion of agricultural land to residential and commercial uses (Maricopa County Farm Bureau, 2003) |
| Wind Erosion – Construction | -19% | MCESD strengthening Maricopa County Rule 310 to increase the rule effectiveness for this category from 63% to 70%. |
| Wind Erosion – Alluvial | -72 | MCESD applying Rule Maricopa County 310.01 to control this category by 72%, based on 0% control in 2002. |
| **WIND EROSION – CLEARED AREAS** | | |
| Wind Erosion – Vacant Lots | -36% | MCESD strengthening Maricopa County Rule 310.01 to increase the rule effectiveness for this category from 55% to 71%. |
| | -39% | Projected building of residential and commercial areas (from Vacant Lot Survey, ADEQ, May 2004). |
| | -61% | Overall reduction of 61%. |
| Wind Erosion – Miscellaneous Disturbed Areas | -36% | MCESD strengthening Maricopa County Rule 310.01 to increase the rule effectiveness for this category from 55% to 71%. |
| | -13.6% | Projected building of residential and commercial areas (from County-wide conversion rate). |
| | -45% | Overall reduction of 45%. |
| **NONROAD MOBILE SOURCES** | | |
| Construction Activity | -36% | MCESD strengthening Maricopa County Rule 310 to increase the rule effectiveness for this category from 56% to 72%. |
| **ONROAD MOBILE SOURCES** | | |
| **PAVED ROADS, UNPAVED SHOULDERS, UNPAVED PARKING LOTS, AND TRACKOUT** | | |
| Freeway – Interstate 17, Durango Curve | +6% | Traffic is projected to increase 6%, based on the Maricopa Association of Government's estimate of area traffic increase of 1.5% per year (MAG 2004). |
| Primary Roads | -7% | The 6% traffic increase is offset by a 13% decrease in reentrained emissions by increasing the sweeping frequency to once a week on dirty sections of one-mile roads. |
| Secondary Roads | -1% | The 6% traffic increase is offset by a 7% decrease in reentrained emissions by increasing the sweeping frequency to once a week on dirty sections of one-half-mile roads. |
| **UNPAVED ROAD SHOULDERS AND UNPAVED PARKING LOTS** | | |
| Unpaved Road Shoulders | -10% | Decrease based on recent shoulder stabilization projects that have been completed since the year 2002. |
| Unpaved Parking Lots – | -36% | MCESD strengthening Rule 310.01 to increase the |

| TABLE 5.1<br>Percent Change in Emissions Between 2002 and 2006 Attainment Case | | |
|---|---|---|
| **Emission Category** | **Percent Change in Emissions** | **Reason for Change** |
| Reentrained Dust | | rule effectiveness for this category from 55% to 71%. |
| Trackout | -80% | This decrease comes from the increased sweeping frequency of targeted major (mile and one-half-mile) streets and from more effective enforcement of the trackout provisions of Maricopa County Rules 310 and 316. |
| **INDUSTRIAL SOURCES** | | |
| Area Sources<br>(Except for stacks and windblown, including process, material handling, haul roads, etc.) | -60% | Improved dust control and housekeeping through enhancements to Maricopa County Rule 316. |
| Point (or "Stack") | -17% | Installation of air pollution control equipment on a major brick manufacturing facility (proposed, new Maricopa County Rule 325). |
| Wind Erosion – Industrial Disturbed Surfaces | -75% | From preventive measures to stabilize, water, or tarp the highly-erodible surfaces of facilities on or before high-wind days. |
| Wind Erosion – Stockpiles, or "Storage Piles" | -55% | From additional watering or tarping of storage piles on high-wind days. |

## 5.3 NECESSARY EMISSIONS REDUCTIONS TO MEET THE STANDARD

Eight exceedances that occurred in the Salt River $PM_{10}$ Study Area in 2002 were examined in detail. Each exceedance was compared with the standard and its percentage above the standard calculated.

Two components of $PM_{10}$ concentrations must be considered: background $PM_{10}$ concentrations and the emissions from within the Study Area that contribute directly to $PM_{10}$ concentrations. The Salt River Study Area is a small fraction of the metropolitan total, as are its emissions (3 to 4%). The 'background values,' as the expression is used here, may be defined as those $PM_{10}$ concentrations that would remain in the Salt River $PM_{10}$ Study Area, if all emissions from the Study Area were to cease. The background concentrations result from the emissions of the rest of the metropolitan area, and their resultant transport into the Study Area.

Because emission reductions will take place throughout the Maricopa County $PM_{10}$ Nonattainment Area, the background concentration for the Salt River $PM_{10}$ Study Area will be reduced as well. These background reductions, calculated below, affect the percentage reductions of emissions necessary to meet the standard. The effects are small, because of the size of metropolitan Phoenix, the distribution of these $PM_{10}$ emissions throughout this area, and their diminishing effects with increasing distance, the background values change very little.

**TABLE 5.2**
**Salt River $PM_{10}$ Study Area Background Reductions**
**From Area-Wide Controls**

| Source Category | $PM_{10}$ Emissions Tons/Day | % Total | Background Reduction Percent |
|---|---|---|---|
| Construction Activity Fugitive Dust | 22.85 | 15.86% | 4.53% |
| Entrainment from Construction Trackout | 6.10 | 4.23% | 1.21% |
| Industrial Processes | 2.63 | 1.83% | 0.59% |
| Process Fugitives | 0.42 | 0.29% | 0.09% |
| Paved Road Dust | 56.40 | 39.14% | 11.31% |
| Agricultural Tillage | 5.58 | 3.87% | 1.11% |
| Windblown | 3860 | NA | 25.27% |

Overall background reduction percentages are obtained by applying these percentages to the appropriate portion of the 2002 and 2006 inventories, and calculating the change as a percentage between the two years. This percentage is then applied to the 2002 background concentration to give the 2006 background value. Both sets of background concentrations are given in Table 5.3 (below).

**TABLE 5.3**
**Salt River $PM_{10}$ Study Area Background $PM_{10}$ Concentrations and their Responses to Anticipated Area-Wide Emission Reductions by 2006**
**(Units are $\mu g/m^3$, 24-hour averages)**

| Exceedance Date | Winds | 2002 | 2006 | % Change |
|---|---|---|---|---|
| 15-Apr-02 | High | 88 | 82 | 6.8 |
| 26-Apr-02 | High | 72 | 67 | 6.9 |
| 16-Dec-02 | Low/Mod | 67 | 66 | 1.5 |
| 8-Jan-02 | Low/Mod | 68 | 67 | 1.5 |

For a more detailed discussion, refer to Chapter 6, "2006 Predicted Concentrations and Controls," of the TSD.

The necessary percentage reductions for exceedance days are high, ranging from approximately 20 to 60 percent, depending on the exceedance (Table 5.4). The emissions reductions percentages necessary to meet the $PM_{10}$ standard are considerably higher than the percentages by which the shown exceedances surpass the standard. The net result is that the standard is roughly twice as difficult to achieve as it would be without the background values. For April 15th, at the West 43rd Avenue monitor (Table 5-4, row two), the exceedance surpasses the standard by 38 percent, but the emission reduction required to meet the standard is 58 percent - 1.6 times the amount by which the standard is exceeded.

**TABLE 5.4**
**Reductions of Emissions Necessary to Meet the Standard for Eight Salt River $PM_{10}$ Exceedances**

| Date | Site | Winds | Measured $PM_{10}$ | % Above | 2006 Background | %Reduction to Meet the |
|---|---|---|---|---|---|---|

| | | | (µg/m$^3$) | Std | (µg/m$^3$)* | Standard |
|---|---|---|---|---|---|---|
| 26-Apr-02 | SR | High | 249 | 40 | 67 | 54 |
| 15-Apr-02 | WF | High | 243 | 38 | 82 | 58 |
| 26-Apr-02 | DC | High | 232 | 35 | 67 | 50 |
| 15-Apr-02 | DC | High | 198 | 24 | 82 | 41 |
| 15-Apr-02 | SR | High | 184 | 18 | 82 | 33 |
| 26-Apr-02 | WF | High | 174 | 14 | 67 | 22 |
| 16-Dec-02 | WF | Low/Mod | 181 | 17 | 66 | 27 |
| 8-Jan-02 | SR | Low/Mod | 174 | 14 | 67 | 22 |

## 5.4 ATTAINMENT AND EMISSION REDUCTIONS

Table 5.5, below, assesses the achievement of attainment for eight exceedances in Salt River Study Area for 2002. For each of the eight exceedances, the measured concentration is followed by the percentage reduction necessary to achieve the standard. This is followed by the percentage reduction obtained through the additional controls. This percentage includes the adjustment to background concentrations to reflect metropolitan-wide controls. Attainment is shown for all eight, although several exceedances are in attainment by a narrow margin.

## 5.5 ATTAINING THE $PM_{10}$ STANDARD - CONCLUSIONS

The $PM_{10}$ monitoring record in the Salt River $PM_{10}$ Study Area, which began in 1994, as well as the intensive monitoring work conducted in April – December 2002, clearly demonstrate that this portion of the Salt River airshed has not met the 24-hour National Ambient Air Quality Standard for $PM_{10}$.

The construction of a complete emissions inventory, the development of a background concentration method, and the application of the most well used, Environmental Protection Agency dispersion model, Industrial Source Complex, have produced the results discussed in Section 6.2.3. These results were presented in the form of realized versus necessary reductions to meet the standard, for each of the eight exceedances recorded during the 2002 intensive study period. The realized reductions -- the predicted 2006 percentage reductions of the model-predicted $PM_{10}$ concentrations from their 2002 concentrations – themselves depend on substantial emission reductions by 2006.

These emission reductions concern earthmoving and related activities; industrial activities, principally materials handling and haul roads; additional street sweeping to reduce reentrained road dust; the reduction of trackout by both sweeping and better regulatory efforts aimed chiefly at the industrial and construction facilities, and the continued retirement of agricultural land in the Salt River area (80% by 2006). Explained in detail in Chapter 4 and supplemented in Table 6-6, these emission reductions are essential to demonstrate attainment for all eight exceedances by 2006. Commitments from Maricopa County and the cities and towns within the nonattainment area will identify rules to be amended, enforcement efforts, and work practices in such a way as to realize all of these potential emissions reductions. With assertive efforts by these entities and the regulated communities, the emissions reductions can be achieved by 2006.

**Table 5.5**
**Salt River $PM_{10}$ Study Area Exceedances and Attainment Status in 2006**

| Date | Site | Winds | $PM_{10}$ | Reduction % | Is the Standard Attained? |
|---|---|---|---|---|---|

| | | | (µg/m$^3$) | Needed | Obtained | |
|---|---|---|---|---|---|---|
| 26-Apr-02 | Salt River | High | 249 | 54 | 58 | YES |
| 15-Apr-02 | West 43rd | | 243 | 58 | 63 | YES |
| 26-Apr-02 | Durango | | 232 | 50 | 58 | YES |
| 15-Apr-02 | Durango | | 198 | 41 | 44 | YES |
| 15-Apr-02 | Salt River | | 184 | 33 | 54 | YES |
| 26-Apr-02 | West 43rd | | 174 | 22 | 74 | YES |
| 16-Dec-02 | West 43rd | Low/Mod | 181 | 27 | 36 | YES |
| 8-Jan-02 | Salt River | | 174 | 22 | 41 | YES |

# Chapter 6: DEMONSTRATION OF REASONABLE FURTHER PROGRESS AND CONTINGENCY MEASURES

## 6.1 OVERVIEW of ATTAINMENT DEMONSTRATION

Part D of the 1990 Clean Air Act Amendments (CAA), "Plan Requirements for Nonattainment Areas," § 171(1), defines "Reasonable Further Progress" (RFP) as, "…such annual incremental reductions in emissions of the relevant air pollutant as are required by this part or may reasonably be required by the Administrator for the purpose of ensuring attainment of the applicable national ambient air quality standard by the applicable date." The modeling results that ADEQ has presented in this plan's Chapter 5, "Demonstration of Attainment of $PM_{10}$ National Ambient Air Quality Standards" for the Salt River Study Area, show that all eight Study Area exceedances can be shown to meet the national $PM_{10}$ standards by December 31, 2006, with a recommended, feasible set of control strategies.

## 6.2 REASONABLE FURTHER PROGRESS

According to the General Preamble (59 FR 41998, at 42015, August 16, 1994), the $PM_{10}$ nonattainment area SIP must include quantitative milestones, based on annual $PM_{10}$ emissions, to be achieved every three years until the area is redesignated attainment, and which demonstrate reasonable further progress toward attainment by the applicable date. The pertinent milestone achievement dates for the Maricopa County $PM_{10}$ Serious Nonattainment Area, as presented in the *Revised MAG 1999 Serious Area Particulate Plan for $PM_{10}$ For the Maricopa County Nonattainment Area* (1999/2000 MAG SIP or MAG SIP) (February 2000), are: 2001, 2003, and 2006. The milestone achievement date that was analyzed in this plan for achieving the 24-hour NAAQS is 2006. ADEQ is in the process of gathering data from state, county, and local jurisdictions, and expects to provide it to EPA with final control measure commitments.

The 1999/2000 MAG SIP used emissions from its 1995 base modeling year, and 2001, 2003, and 2006 committed control measure inventories in the construction of its RFP analysis, which demonstrated attainment of the $PM_{10}$ NAAQS no sooner than 2006. The MAG SIP RFP analysis evaluated the committed control measures as a package to estimate total emissions for 2001 and 2003, assuming full implementation of the measures related to:

- Coordination of traffic signals;
- Cleaner Burning Gasoline;
- Restaurant charbroilers;
- $PM_{10}$ episode thresholds;
- Curbing, paving, or stabilizing shoulders on unpaved roads; and
- Paving, vegetating, and chemically stabilizing unpaved access points.

The MAG SIP assumed partial implementation with respect to:

- Strengthening and better enforcement of Maricopa County Rule 310;
- Paving unpaved roads;
- Reducing particulate emissions from unpaved parking lots and vacant, disturbed land; and
- Purchase/use of $PM_{10}$-efficient street-sweepers.

The MAG SIP assumed that the measure requiring commercial heavy-duty diesel vehicles to meet 1998 standard had no effect until 2004. Details regarding the modeling assumptions used to estimate the 2001 and 2003 emissions reductions are shown in MAG SIP TSD, Appendix IV, Exhibit 3.

### 6.2.1 REASONABLE FURTHER PROGRESS – CONCLUSIONS

The 1999/2000 MAG SIP RFP analysis showed attainment of $PM_{10}$ NAAQS in 2006 (see MAG SIP Chapter 8, and Figure 8-4). The RFP analysis shows that the 2001 and 2003 emissions, given implemented SIP control measures, would result in emissions reductions from 191 metric tons per day of $PM_{10}$ during MAG's 1995 base modeling year, to 152 metric tons per day of $PM_{10}$ for 2001, and to 142 metric tons per day of $PM_{10}$ for 2003. The MAG SIP demonstrates that $PM_{10}$ NAAQS attainment is achieved in 2006, with total $PM_{10}$ emissions of 130 metric tons per day. In addition, the MAG SIP, using regional UAM-LC modeling, estimated that both the peak 24-hour maximum, and the annual average $PM_{10}$ concentrations would be under the required NAAQS limits of 150 $\mu/m^3$, and 50 $\mu/m^3$, respectively, in 2006, in the Maricopa County $PM_{10}$ Nonattainment Area.

ADEQ's modeling in the *Revised $PM_{10}$ State Implementation Plan for the Salt River Area*, considered the combined impact of control measures adopted in the 1999/2000 MAG SIP and those proposed in this SIP. ADEQ's modeling indicates achievement of the 24-hour $PM_{10}$ NAAQS in the Salt River Study Area by December 31, 2006, assuming implementation of the $PM_{10}$ committed control measures this SIP proposes. ADEQ expects that attainment of both the annual and 24-hour $PM_{10}$ NAAQS will be achieved in the Maricopa County $PM_{10}$ Serious Nonattainment Area by December 31, 2006, assuming implementation of the MAG SIP and Salt River SIP controls. Appendix E of this plan contains ADEQ's draft analysis of the current implementation status of the 1999/2000 MAG SIP committed control measures.

## 6.3 CONTINGENCY MEASURES

Section 172(c)(9) of the CAA requires that state implementation plan provide for the implementation of specific measures to be undertaken, without further action by the state or the EPA Administrator, if a nonattainment area fails to make reasonable further progress, or fails to attain the national primary ambient air quality standard, or applicable milestone, by the relevant attainment date. The Clean Air Act requires that annual emissions be used to establish both RFP milestones and contingency measure goals. Chapter 8 of the 1999/2000 MAG SIP that the annual emissions reported for the milestone years – 2001, 2003, and 2006 – did not reflect the implementation of the following MAG SIP committed measures:

- Agricultural Best Management Practices;
- Off-Road Vehicle and Engine Standards;
- Clean Burning Fireplace Ordinances;
- Additional Dust Control Measures (City of Tempe); and
- Additional Dust Control Measures (City of Phoenix).

Since the MAG SIP did not include the above measures in calculating the annual emission total used to set the milestones, the SIP reasons that if a milestone goal is missed, the above measures will provide interim public health and welfare protections, and should be considered contingency measures. Chapter 5 of the MAG SIP TSD shows the results of MAG's modeled emissions reductions from MAG SIP committed contingency measures, in 2006, estimating that the sum of the impacts from all five measures will be estimated reductions of approximately 5.4 metric tons per day of $PM_{10}$ (see 1999/2000 MAG SIP, Chapter 8, "Demonstration of Attainment Status," page 8-17).

All current, committed contingency measures noted in the 1999/2000 MAG SIP are applicable to sources affecting $PM_{10}$ concentrations in the Maricopa County $PM_{10}$ Nonattainment Area. This fact

is particularly significant since modeling for attainment in the Salt River Study Area was challenging due, in part, to high $PM_{10}$ concentrations from surrounding background areas (see SIP, Chapter 5, Table 5-4, Reductions of Emissions Necessary to meet the Standard for Eight Salt River $PM_{10}$ Exceedances). Also, commitments for implementing the $PM_{10}$ control measures described in this SIP will affect not only significant sources in the Salt River Study Area, but similar sources throughout the Nonattainment Area – further decreasing background $PM_{10}$ concentrations and facilitating attainment by December 31, 2006.

# EMISSION SOURCE CATEGORY DESCRIPTIONS

**Agricultural Tillage**
Agricultural tillage is defined as emissions from agricultural operations. The emissions in this category originate from agricultural tilling (land preparation, planting, weed control), and agricultural equipment exhaust.

**Construction Activity**
Construction activity is defined as construction of residential housing, businesses, and industrial buildings. The emissions in this category originate from earthmoving and to a lesser degree, construction equipment exhaust.

**Freeway**
Freeway emissions are defined as those emissions from vehicle traffic on the Durango Curve on Interstate 17. The emissions in this category originate from brake wear, tire wear, exhaust, and road dust reentrainment

**Industrial Sources**
Industrial sources are defined as facilities such as factories, power plants, and rock product operations that are permitted by the county or by the state. The emissions in this category originate from fuel burning, industrial processes, materials processing, construction equipment exhaust, and vehicle traffic over disturbed surfaces. Emissions from these sources are typically separated into four categories: 1) stack emissions, which are emissions that exit through stacks from combustion and materials processing and are specifically described in MCESD's permit and/or emission survey for industrial sources (greater than 10 tons $PM_{10}$ per year), 2) industrial area emissions, which are all other emissions from the facility, other than windblown, and includes material handling, crushing, screening, traffic on the facility, and the smaller stacks not listed in MCESD's permits or survey forms, 3) windblown emissions from stockpiles, and 4) windblown emissions from the land surface of the facility. Industrial areas emissions have been further divided in to subcategories based on which MCESD rule applies to their operation, and into subcategories based on their nature (e.g., crushing and screening, haul road traffic, combustion, and so forth).

**Primary Roads**
Primary roads are defined as the major urban paved roads that are located at one-mile intervals. The emissions in this category originate from brake wear, tire wear, exhaust, and road dust reentrainment (road dust "kicked back" into the air from vehicles driving over it).

**Secondary Roads**
Secondary roads are defined as the minor urban paved roads that are located at half-mile intervals. The emissions in this category are the same as those in the primary roads category.

**Unpaved Parking Lots**
Unpaved parking lots are defined as parking lots, which have a gravel surface. The emissions in this category originate from reentrained dust from vehicle traffic in the unpaved parking lot.

**Unpaved Road Shoulders**
Unpaved road shoulders are defined as those road shoulders along paved roads that are not paved or stabilized. The emissions in this category originate from dust from the unpaved road shoulders being reentrained by the wake effect of large vehicles, such as large trucks and buses, traveling on the roadway.

**Wind Erosion**
Wind erosion is defined as the transport of disturbed / unconsolidated soil due to the movement of wind.

**Wind Erosion – Agricultural**
Agricultural land is defined as agricultural fields for growing crops. The emissions in this category originate from wind erosion of disturbed topsoil from agricultural fields in the time period between harvesting and when a crop is tall enough to act as a windbreak.

**Wind Erosion – Alluvial Channels**
Alluvial channels are defined as geological features such as dry streambeds, arroyos, and gullies, that are dry most of the year and contain loose soil, especially silt, due to water and wind erosion. The emissions in this category originate from wind erosion of material in the alluvial channel.

**Wind Erosion – Cleared Areas**
Cleared areas consist of vacant lots and miscellaneous disturbed areas. Vacant lots are defined as undeveloped land with disturbed topsoil that are in residential or business areas, and miscellaneous disturbed areas are defined as areas with disturbed topsoil that do not fall into the previously mentioned emission categories. The emissions in this category originate from wind erosion of disturbed topsoil.

**Wind Erosion – Construction**
Construction is defined as those areas that have disturbed topsoil due to construction activity (e.g., earthmoving). The emissions in this category originate from wind erosion of disturbed topsoil on construction sites.

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